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EFFECTS OF AN ONLINE TRAINING IN THE ZIGGURAT MODEL
ON THE AUTISM KNOWLEDGE OF SCHOOL-BASED
SPEECH-LANGUAGE PATHOLOGISTS (SLPs)

DISSERTATION

A dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Rehabilitation Sciences at the University of Kentucky by

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Tullahoma, Tennessee

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Occupational Therapy

Lexington, Kentucky

2015

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ABSTRACT OF DISSERTATION

EFFECTS OF AN ONLINE TRAINING IN THE ZIGGURAT MODEL ON THE AUTISM KNOWLEDGE OF SCHOOL-BASED SPEECH-LANGUAGE PATHOLOGISTS (SLPs)

Autism Spectrum Disorder (ASD) is a low-incidence disorder with high impacts on individuals, families, and society. School-based speech-language pathologists (SLPs) have tremendous responsibilities toward individuals with ASD, but pre-service SLPs are not adequately trained to fulfill these expectations. In order to reduce the widespread financial and social impact of ASD, school-based SLPs need to complete effective training to prepare them for the selection of established social-communication practices. One framework for the selection of individualized intervention is the Ziggurat Model (Aspy & Grossman, 2008). The following study used mixed methods to investigate the research question: “Does the ASD knowledge base of ASHA-certified school-based SLPs change when they complete an online training module based upon Aspy and Grossman’s Ziggurat Model? If so, what are those changes?”

A pre-test post-test control group design demonstrated a significant difference in the experimental group’s and the control group’s pre-test post-test change scores, as demonstrated by an independent samples t-test ($p=.039$, 18df). Qualitative data analysis resulted in six themes. While the online training of Aspy and Grossman’s Ziggurat Model used in this study was an effective method with which to train school-based SLPs in using a comprehensive framework, more rigorous research is needed on this model relative to the selection of intervention.

Keywords: Autism Spectrum Disorder (ASD), andragogy, evidence-based practice (EBP), Ziggurat Model, and speech-language pathologist.

Wendy L. Wilkerson, M.S., CCC-SLP
December 2015

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To my sweet son, Preston,

Don't *ever* let anyone or anything in this life hold you back.

Don't ever give up . . . no matter what!

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David, thank you for being the “glass is full” part of my life and always encouraging me to finish this degree. Mom and Dad, thank you both for providing every possible *opportunity* for me to excel in whatever I chose. Jennifer, thanks for being the best sister (and aunt to Preston) anyone could ask for!

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Chapter 1 Introduction

1.1 Autism Spectrum Disorder

1.1.1 History and Characteristics

Leo Kanner (1943) reported the first cases of autism, using the term to describe eleven children with the following commonalities: 1) lack of social skills, 2) communication differences, 3) sensory differences, 4) restricted interests/patterns of behavior, 5) strengths in fine motor coordination, and 6) born of what Kanner referred to as intelligent families.*

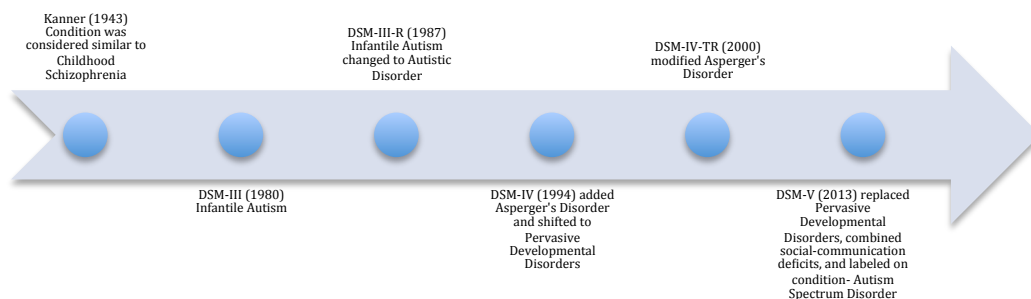
Figure 1.1 shows the timeline of the evolving definition of Autism Spectrum Disorder (ASD). Although Kanner's publication sparked interest in autism, the condition was regarded as similar to childhood schizophrenia for many years (Volkmar & McPartland, 2014; King, Navot, Bernier, & Webb, 2014). *Infantile Autism* was first acknowledged as a category under *Pervasive Developmental Disorder* in the Diagnostic and Statistical Manual-Third Edition (DSM-III) (American Psychiatric Association) (APA, 1980). DSM-III-R (APA, 1987) modified the label of *Infantile Autism* due to its insufficiency in diagnosing cases which were identified at a later age, changing its appellation to *Autistic Disorder* (Volkmar & McPartland, 2014). These early descriptions of the condition discussed social deficits apart from communication deficits. The DSM-IV (1994) again amended the definition of autism, adding *Asperger's Disorder* (Asperger, 1944) as an additional *Pervasive Developmental Disorder*. The primary difference in Asperger's Disorder and Autistic Disorder was that individuals identified as

* Kanner did not specify the measure by which he determined families were intelligent; however, he referenced the occupations and education levels of family members.

having Asperger's Disorder exhibited essentially normal language skills, but they manifested social deficits (Frith, 2004; Sanders, 2009). The DSM-IV-TR (APA, 2000) revised the narrative section for Asperger's Disorder due to reported inconsistencies in diagnosing the condition (Volkmar & Partland, 2014). The DSM-V (APA, 2013) combined the previously separated social and communication disturbances into one deficit area called social-communication, to characterize them as a dyad instead of a triad of impairments. The DSM-V replaced the PDD category and the specific diagnoses within the PDD category to create one all-encompassing classification—Autism Spectrum Disorder (ASD) (APA, 2013).

In the most recent DSM-V Manual, the American Psychological Association (DSM-V, 2013) describes autism as a spectrum disorder (ASD) (Appendix A), meaning the intensity of these impairments can greatly differ from one individual to another. ASD ranges from Level 1, requiring the least amount of support from one's environment to a Level 3, requiring very substantial support (APA, 2013). Contrary to initial belief (Kanner, 1943), ASD is reported to occur in all racial, ethnic, and socioeconomic groups (Center for Disease Control (CDC), 2015).

Figure 1.1: Timeline of Autism Definitions



1.1.2 Incidence, Prevalence, and Other Facts

Worldwide, 1 child in 160 has ASD (World Health Organization (WHO), 2015). The Center for Disease Control (CDC) reports that on average, 1 in 68 children in the United States are diagnosed with ASD (CDC, 2015). ASD is almost 5 times more common among boys than girls (CDC, 2015). Studies in Asia, Europe, and North America have identified individuals with ASD with an average prevalence of about 1% (CDC, 2015; Kim et al., 2011). Almost half (46%-50%) of children identified with ASD have average to above average intellectual ability (CDC, 2015; WHO, 2015). Children are at a higher risk for ASD if they are born to older parents (CDC, 2015; Durkin et al. 2008). A small percentage of infants born prematurely or with low birth weight are at greater risk for having ASD (CDC, 2015; Schendel & Bhasin, 2008). Most individuals diagnosed with ASD are also diagnosed with one or more non-ASD developmental diagnosis (83%) (CDC, 2015; Levy et al., 2010). In 2011-12, the National Center for Education Statistics (NCES) reported 455 out of 6,401 (7%) children aged 3-21 years served under IDEA, Part B had autism (NCES, 2015). The majority of individuals with ASD exhibit significant sensory processing differences (Baranek, 2002; Dunn, Myles, & Orr, 2002). Research suggests that many factors, both genetic and environmental, influence early brain development, contributing to the onset of ASD (WHO, 2015). As the incidence and prevalence of ASD continues to increase, so does its impact on individuals, their families, and society. This paper focuses on the impact of the social-communication deficits of ASD.

1.2 The Impact of ASD (Individuals, Families, and Society)

1.2.1 Individuals

ASD challenges individuals, their families, and society in several ways.

Individuals with ASD display social-communication deficits throughout the lifespan.

The social-communication deficits of a child with ASD can linger and inhibit the adult with ASD from participating in and contributing to society. Children with ASD have difficulty participating in friendships and extracurricular activities due to their different social-communication repertoires and/or delayed social-communication skills.

According to parent reports, 44% of students with ASD *never* see friends outside of school, 84% rarely/never receive telephone calls from friends, and only 35% participated in community service or volunteer activities (National Longitudinal Transition Study-2 (NLTS2) Data Brief, 2004).

1.2.2 Families and Society

Most adults with ASD reside with their parents, or others care for them full-time (Gray et al., 2014). Only eighteen percent of adults with ASD are in paid employment. The majority (99%) of adults with ASD participate in some type of daytime activity, but a significant number of these adults do so for less than 20 hours each week (Gray et al., 2014). When a group of ninety parents of children with ASD were surveyed, the top ten priorities addressed six themes—social skills, communication, academic, community living, vocational, and recreation/leisure skills (Pituch et al., 2011 in American Speech-Language-Hearing Association (ASHA), 2015). In another study, parents indicated social skills and communication were high priorities (Spann, Kohler, & Soenksen, 2003 in ASHA, 2015). Parents of children with ASD report frustrations with using school and

community health services for their children in that sometimes there were no providers or a service was not provided in their geographical area. Other obstacles included being unable to obtain information about/for services, using up eligibility for programs, and transportation problems (Montes, Halterman, & Magyar, 2009 in ASHA, 2015).

1.2.3 Financial Burdens

Another challenge resulting from ASD is the financial strain on families of individuals with ASD and the financial burden on taxpayers. Caring for a child with ASD for health care, therapies, education, family-coordinated services, and caregiver time costs approximately \$17,000 more per year than for a child without ASD (CDC, 2015; Lavelle et al., 2014). In 2005, the average annual costs for Medicaid-enrolled children with ASD were \$10,709, per child, which was about six times higher than the costs for children without ASD (\$1,812) (CDC, 2012). In addition to medical costs, intensive behavioral interventions for children with ASD cost \$40,000 to \$60,000 per child per year (Amendah, Grosse, Peacock, & Mandell, 2011). Societal costs of caring for children with ASD were estimated at over \$9 billion in 2011 (CDC, 2015; Lavelle et al., 2014). Out of ninety-seven students with ASD in Kentucky who were out of high school for one year, only 17.5% were competitively employed (Kleinert, 2013).

Improved quality of life, costs of ASD, and poor employment rates of individuals with ASD provide tremendous motivation for developing *evidence-based, effective* practice and interventions with which to reduce the disorder's social-communication symptoms and the resulting widespread influence.

1.3 Evidence-Based Practices

The American Speech-Language-Hearing Association's (ASHA) stance regarding evidence-based practices (EBP) states:

At the most basic level, EBP means that there is empirical evidence to document the effectiveness of a particular treatment procedure or assessment instrument.

Such evidence increasingly is required before an insurance company will pay for a procedure or a state education agency will approve funding for a particular program (ASHA, 2015).

ASHA identifies three parameters for EBP; clinical expertise/expert opinion, external scientific evidence, and client/patient/caregiver perspectives (ASHA, 2015). The demand for EBP in the area of ASD continues to rise, and SLPs (especially school-based SLPs) have many responsibilities to this population (ASHA, 2006).

1.3.1 Role of SLPs Relative to the Impact of ASD

The International Classification of Functioning, Disability, and Health (ICF) is the World Health Organization's (WHO) framework for measuring health and disability at both the individual and population levels. The ICF domains include *body*, *individual and societal perspectives*, and *activity/participation* (WHO, 2012). Individuals with ASD may demonstrate deviated social language in their *body function/structure* characterized by off-topic comments. Such comments may limit their communication *activity* by making them more reluctant to *participate* in conversations with others. Their intended communication partners may place more restrictions on their *participation* by ignoring their off-topic comments or by avoiding such conversational attempts. Various

environmental and *personal* factors may positively or negatively influence the individuals' with ASD conversational experiences.

Individuals with ASD need access to effective interventions to improve their daily lives and contributions to society, and to reduce the societal costs previously mentioned. Some individuals' restrictive interests and stereotypical behaviors limit their *participation* in the community while others' participation may be more confined due to their daily struggles with communication. One major contribution of an individual's speech-language pathologist (SLP) is connecting the individual with ASD to his or her community. The American Speech-Language-Hearing Association (ASHA) lists eight minimal roles for which SLPs are responsible when working with individuals with ASD: 1) screening, 2) diagnosis, 3) assessment and intervention, 4) working with families, 5) collaboration, 6) professional development, 7) research, and 8) advocacy (ASHA, 2006). These roles hold SLPs at least partially responsible in the early identification of ASD, intervention for ASD, developing productive relationships with families of individuals with ASD (and relationships with the individuals with ASD), developing productive relationships with colleagues in other disciplines, staying current in the latest and most effective practices for ASD, participating in and conducting research in ASD, and advocating for individuals with ASD.

The majority of ASHA SLPs work in school systems (56%) (ASHA, 2013). Ninety percent of these school-based clinicians serve students with ASD (ASHA, 2014). An important issue for school-based SLPs is their lack of knowledge of ASD and training in ASD. Schwartz and Drager (2008) used an original 52-item survey to determine the amount of knowledge and level of training of school-based SLPs. Some SLPs did not

understand what autism was or how it was diagnosed. Assisting with autism diagnosis is one of the roles an SLP must fulfill (ASHA, 2006). Schwartz and Drager (2008) also discovered that many SLPs did not receive training for ASD in their graduate programs. Overall, results showed there was an unbalanced knowledge of autism and insecurities of how to provide effective services (Schwartz & Drager, 2008).

Price, Roberts, Henderson, and Kelley (2009) administered a modified online version of the Autism Survey (Stone, 1987) to undergraduate and graduate students in speech-language pathology programs in Mississippi. Findings revealed that participants demonstrated the greatest amount of knowledge about diagnosis of and intervention for autism (which could encompass ASHA's role of assessment and intervention), less knowledge about the characteristics of autism (particularly in the areas of assessment, working with families, collaboration, professional development, research, and advocacy), and the least knowledge about the causes and prevalence of autism (Price et al., 2009). School-based SLPs are lacking in ASHA's expected roles for students with ASD, and pre-service SLPs are not being trained to meet those expectations.

How can this problem be solved? How can school-based SLPs not only meet and exceed ASHA's eight roles and responsibilities when working with students with ASD but also reduce the social-communication symptoms in individuals with ASD? The Ziggurat Model by Aspy and Grossman (2008) may provide school-based SLPs and the institutions that train them a comprehensive framework within which to reach and exceed ASHA's expectations while simultaneously addressing the social-communication issues. Given that many SLPs are currently working without training in this type of integrated model suggests the need for developing effective training models.

1.3.2 How Should We Teach School-Based SLPs?

1.3.2.1 Knowles' Principles

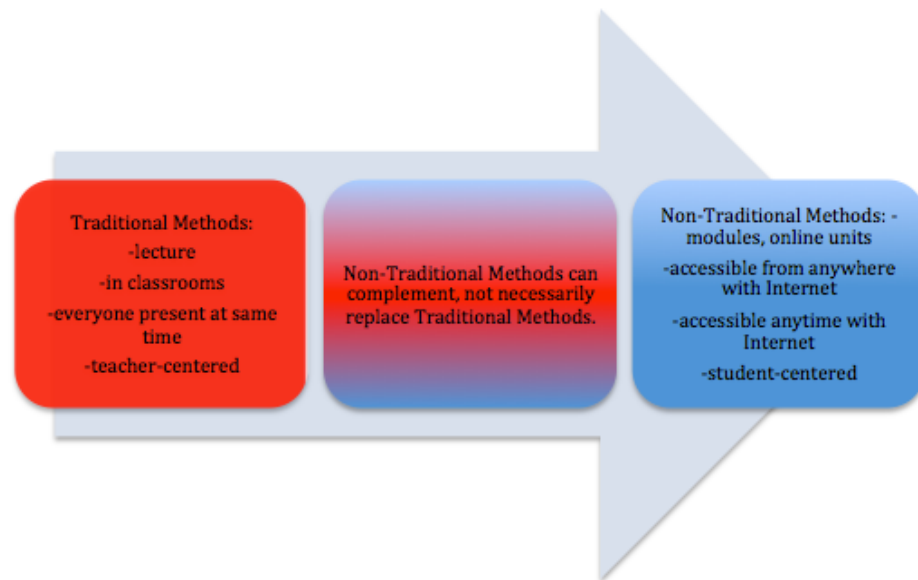
Training currently practicing SLPs will require familiarity with adult training or adult learning since school-based SLPs are adults. Andragogy (the method of teaching adults) is composed of six principles, including 1) the learner's need for information, 2) self-concept, 3) previous experiences, 4) readiness to learn, 5) orientation to learning, and 6) motivation (Knowles, 1970). Adults determine their own learning needs and expect education to be convenient for them (Dumchin, 2010). Adult learners want to be respected as students and as adults. They want their responses to be considered valuable. Third, adult learners gain information by relating to their personal experiences. Fourth, adults must be ready to learn. Maslow believed survival, safety, love, and belonging needs must be met before an individual can be interested in acquiring knowledge (Ornstein & Hunkins, 2013). Fifth, adult learners need access to their preferred learning style. Some learn best by hearing (auditory), some by seeing (visual), and some by doing (kinesthetic). Finally, adults must be motivated to learn. Dumchin (2010) identified intrinsic and extrinsic motivators for adult learners. He stated that intrinsic motivators are enhanced self-concept, increased ability to manage stress, and enhanced job satisfaction. Extrinsic motivators are promotions, salary increases, better job opportunities, and better working conditions.

1.3.2.2 Methods of Andragogy

As discussed, Knowles' (1970) principles are the accepted foundation for adult learning, but variation exists in the methods of andragogy. As adult learners change, andragogy must also evolve (Figure 1.2). Traditional lecturer-controlled environments

have been criticized, resulting in more student-centered methods. Online education is one such student-centered method. Online learning is a computer-mediated approach in which faculty and student interactions are conducted through the Internet by using synchronous (real-time) and asynchronous (not real-time) approaches (Dumchin, 2010). During 2000-2001, the percentage of public four-year institutions offering distance education courses had already reached 89%, and this percentage continues to grow (Dumchin, 2010). However, online learning does not necessarily have to replace classroom teaching. “Online learning can serve as a complement to classroom interaction by enhancing critical thinking and promoting engagement in the course content outside the classroom” (Halcomb & Peters, 2009, p. 66).

Figure 1.2: Evolution of Adult Learning



1.3.2.3 Web-based Education

Fink's (2003) taxonomy of significant learning has influenced Web-based course design and shares characteristics similar to those of Knowles. The taxonomy consists of

six principles: 1) having a foundational knowledge, 2) application, 3) integration, 4) human dimension, 5) caring, and 6) learning how to learn (Magnussen, 2006). The principles can be used for planning a course, creating the objectives, or testing student learning. Regarding development of foundational knowledge, instructors are encouraged to focus on the relationship of major concepts. Second, instructors need to ensure that the students' new knowledge is used in new ways. This can be accomplished by group assignments with real-life significance. Third, integration involves students becoming active participants by using their learning histories to make learning relevant and personal. Fourth, the human dimension aspect of Fink's taxonomy suggests that online learning is social. Faculty should encourage students to participate in a "student lounge" in order to get to know the others in the course with whom they interact. Fifth, students must care about their classmates and about learning, in general. Faculty should promote and begin the process of sharing personal experiences, and this can be accomplished in a professional manner. The final aspect of Fink's taxonomy is learning how to learn. A troubleshooter can be made accessible to students and faculty in order to assist with connection issues or downloading problems. Many online programs provide tutorials as a part of the course to familiarize students with the layout and processes before the course actually begins.

1.3.2.4 Core Implementation

A third paradigm of adult learning is that of core implementation. Fixsen, Blase, Naoom, and Wallace (2013) expressed concerns about the missing link between the science and service of evidence-based practices, proposing a model of core implementation components. This model suggests the following: 1) it is important to

select the best staff to carry out the evidence-based program, 2) preservice and in-service training are efficient ways to learn when, where, how, and with whom to use new approaches and new skills, 3) consultation and coaching provide support from the introduction of the new intervention throughout its lifetime, 4) staff performance evaluations help the practitioner continue to improve his or her effectiveness with consumers, 5) data systems provide outcome information to support decision-making, 6) facilitative administrative supports help keep staff organized and focused on the desired intervention outcomes, and 7) external systems support the work of practitioners. Fixsen and colleagues (2013) believe that implementation does not all happen at once and may take two to four years to complete in some organizations.

Joyce and Showers (2002) found that training that consisted of theory and discussion coupled with demonstration, practice, and feedback resulted in only 5% of teachers using new skills in the classroom, but when on-the-job coaching was added to training, 95% of the teachers used the new skills in the classroom. This supports the idea that adults learn best by doing (Russell, 2006) and by being active participants (Halcomb & Peters, 2009; Magnussen, 2006; Robert, Pomarico, & Nolan, 2011).

Adult learners desire convenience. Online courses that are accessible at one's leisure complement the busy, complex lifestyles of adult learners. Online participants desire to be "understood, supported, and informed" (Todkill & Powell, 2013, p. 1019). Online courses can result in increased diversity of course content and more diverse perspectives shared by participants. Internet-based interventions is "a new emerging area, likely to be of increasing importance in health care as health systems seek cheaper

ways to deliver effective services, and researchers seek new ways to recruit and engage participants” (Todkill & Powell, 2013, p. 3).

Chapter 2 Background

2.1 Speech-Language Therapy and ASD

Attempts to improve social-communication skills in individuals with ASD can be reviewed as far back as the early 1970s (Lovaas, Koegel, Simmons, & Long, 1973; Reichler & Schopler, 1976). Early research focused on behavioral interventions to reduce aversive behaviors and increase social interaction. One of these interventions that is still commonly used, behavior modification (also known as applied behavior analysis) (ABA) was described as intense (often 40 hours/week) and very structured, using antecedent-behavior-consequence sequences to change behavior (Lovass, 1987). While ABA is effective in modifying behavior, criticisms of the approach include: 1) gains are extremely slow, 2) often participants do not generalize learned skills to other situations, and 3) participants are often unmotivated (Mohammadzahar, Koegel, Rezaee, & Rafiee, 2014).

Researchers investigated these behavioral approaches while developing newer approaches to facilitate functional speech and language in individuals with ASD. Many of the new approaches added naturalistic components to the behavior modification strategies to try and improve child participation. Some of these components were: 1) allowing children to choose their activities/reinforcement (Koegel, O'Dell, & Koegel, 1987), 2) balancing the review of old skills while teaching new skills (Dunlap, 1984), and 3) reinforcing attempts (Koegel, O'Dell, & Dunlap, 1988). The evolution of these trial-and-error interventions has resulted in an immense science; however, sorting through that science requires a tremendous degree of scholarship... the scholarship of more than one

individual. Two research teams, in particular, have recently produced such scholarship, addressing the social-communication deficits of individuals with ASD (National Autism Center (NAC), 2009 in ASHA, 2015; Wong et al. 2014). This literature review will focus on ASHA's EBP maps since ASHA serves as a primary source for certified school-based SLPs. It should be noted that the National Autism Center (NAC) has recently published The National Standards Report (2015). This research is not yet included in ASHA's evidence maps, so it will not appear in the following discussion.

2.2 Evidence-based Practice and Interventions

The National Autism Center (NAC) clearly distinguished evidence-based *practice* (EBP) from evidence-based *intervention*. *EBP* is the larger framework with which methods, procedures, and practices are regarded. An example of EBP is, "Early intervention is likely to be beneficial in fostering the development of communication skills in children with ASD" (Level B Evidence) (p. 38) (National Institute for Health and Clinical Excellence (NICE), 2012 in ASHA, 2015). An evidence-based (EB) *intervention* is a specific treatment or strategy used to inform a clinician's EBP (NAC, 2015). An example of an EB intervention is Pivotal Response Intervention (NAC, 2009). EB interventions will be further explained below.

2.2.1 EB Interventions

To guide clinicians in distinguishing EBP, ASHA provides "evidence maps", listing 40 categories for autism *cognitive-language* interventions, one category for *hearing* and autism, two categories for *speech* and autism, and no studies are listed under *voice* and autism (ASHA, 2015). Studies within each category have been given rankings as to the quality of evidence they provide within ASHA's three parameters which

include: external scientific evidence, clinical expertise/expert opinion, and patient/client/caregiver perspectives (ASHA, 2015). ASHA references the National Standards Project when classifying autism communication and interpersonal (social) interventions (NAC, 2009 in ASHA, 2015). Interventions are labeled as *established*, *emerging*, *unestablished*, or *ineffective/harmful* (NAC, 2009 in ASHA, 2015):

- *Established* (11 interventions)— *A treatment is effective; it is confidently beneficial for individuals with ASD.* The established interventions are: Antecedent Package, Behavioral Package, Comprehensive Behavioral Treatment for Young Children, Joint Attention, Modeling, Naturalistic Teaching Strategy, Peer Training, Pivotal Response Treatment, Schedules, Self-management, and Story-Based Intervention Package.
- *Emerging* (21 interventions)—*Additional high quality studies are necessary before the treatment becomes established, even though the treatment may be beneficial.* Emerging treatments are: Augmentative and Alternative Communication Device, Cognitive Behavioral Intervention Package, Developmental Relationship-based Treatment, Exercise, Exposure Package, Imitation-based Interaction, Initiation Training, Language Training (Production), Language Training (Production & Understanding), Massage/Touch Therapy, Multi-component Package, Music Therapy, Peer-mediated Instructional Arrangement, Picture Exchange Communication System, Reductive Package, Scripting, Sign Instruction, Social Communication Intervention, Social Skills Package, Structured Teaching, Technology-based Treatment, and Theory of Mind Training.

- *Unestablished* (5 interventions)— *Little to no evidence exists on treatment effectiveness. Additional research may label the intervention as effective, ineffective, or harmful.* Unestablished interventions are: Academic Interventions, Auditory Integration Training, Facilitated Communication, Gluten- and Casein-Free diet, and Sensory Integrative Package.
- *Ineffective/Harmful* (0 interventions)—*Enough evidence exists to show a treatment is ineffective or harmful* (NAC, 2009).

2.2.2 Established Interventions by Category

While this literature review mentions emerging, unestablished, and ineffective/harmful social-communication interventions, concentration will be committed to the established interventions. To organize the eleven established interventions, the investigator modified the National Autism Center's classification by assigning each intervention to one of six categories: Didactic/Behavioral, Naturalistic/Pragmatic, Joint Attention, Schedules, Self-Management, and Story-Based (NAC, 2009) (See Table 2.1). These intervention categories will now be further discussed.

Table 2.1: Established Interventions by Category

Category	Characteristics	Example(s)
Didactic/Behavioral	based upon behaviorist or learning theory oldest and most traditional methods high level of adult control antecedents and consequences client is in a passive responder role	behavior chain interruption cueing and prompting/prompt fading environmental modification of task demands special interests time delay reinforcing comprehensive treatment programs
Naturalistic/Normalized	rely on behavioral theory but use child-directed interactions in natural environments intrinsic or natural reinforcers are provided	focused stimulation incidental teaching milieu teaching peer training pivotal response training
Joint-Attention	encourage the basic skills of regulating behaviors of others	pointing to objects showing items/activities to another person following eye gaze
Schedules	presentation of a task list with a series of steps	written words pictures photographs work stations
Self-Management	individual with ASD records their performance of target behaviors and are then provided with reinforcement	checklists writ counters visual prompts tokens
Story-Based	written description of situations in which specific behaviors are expected to occur	social narratives Social Stories™

2.2.3 Didactic/Behavioral

Didactic intervention approaches are based upon the behaviorist theory or learning theory. They are the oldest and most traditional methods. One of the most famous contributions to ASD literature was Lovaas and colleagues (1980). Lovaas' behavioral intervention was a precursor to most interventions used with individuals with ASD. Didactic methods typically include numerous trials, operant conditioning, shaping, prompting, and chaining. A high level of adult/clinician control is prevalent with repetitive drill and practice. Focus is on specific antecedents and consequences with the client assuming a passive responder role (Paul, 2008). Discrete trial training (DTT), Direct Instruction (Miranda-Linee & Melin, 1992), Applied Behavior Analysis (ABA),

Functional Communication Training (FCT) (Carr & Durand, 1985), and Comprehensive Behavioral Treatment Programs for Young Children are examples of didactic/behavioral interventions. While didactic methods have been effective in improving speech and language skills in individuals with ASD, the biggest criticism of them is that they do not teach generalization because they neglect the natural environment (Paul, 2008).

2.2.4 Naturalistic/Normalized

Naturalistic or normalized intervention approaches rely on behavior theory and use child-directed interactions in *natural* environments. Intrinsic or natural reinforcers are provided in lieu of the tangible or edible reinforcers presented in the didactic methods (Paul, 2008). Naturalistic interventions are those that “teach skills in informal settings not primarily designed for instruction” (Ingersoll, Meyer, Bonter, & Jelinek, 2012). Naturalistic methods have derived from two theoretical perspectives: (a) the behavioral perspective, and (b) the developmental social-pragmatic (DSP) perspective (Ingersoll, 2010b; Yoder et al., 1995). Naturalistic methods are based upon learning theory and use direct prompting and reinforcement within natural contexts (Ingersoll et al., 2012). DSP interventions are based upon the social-pragmatic model of language acquisition (Bruner, 1983). Examples of naturalistic/normalized interventions are the Natural Language Paradigm (Koegel et al., 1987), Parent-Implemented Focused Stimulation (Grela & McLaughlin, 2006), Pivotal Response Training (Koegel, 2000; Koegel & Koegel, 2006; Koegel, Koegel, Harrower, & Carter, 1999; and Koegel et al., 1987), and Peer Training (NAC, 2009).

2.2.5 Joint Attention

Joint attention approaches encourage the basic skills of regulating the behaviors of others, often “teaching a child to respond to the nonverbal social bids of others or to initiate joint attention interactions” (NAC, 2009, p. 47). These interventions include pointing to objects, showing items/activities to another person, and following eye gaze (NAC, 2009).

2.2.6 Schedules

The National Autism Center defined schedules as interventions involving “the presentation of a task list that communicates a series of activities or steps required to complete a specific activity” (NAC, 2009, p. 49). Reinforcement often accompanies schedules, and schedules can include written words, pictures, or photographs, or work stations (NAC, 2009).

2.2.7 Self-Management

Self-management strategies teach self-accountability to individuals with ASD by having them record their performance regarding target behaviors and providing them with reinforcement for doing so. Using checklists, wrist counters, visual prompts, and tokens are examples of self-management (NAC, 2009).

2.2.8 Story-Based

Story-based interventions provide a “written description of the situations under which specific behaviors are expected to occur” (NAC, 2009, p. 50). Social narratives (SN) use illustrated stories written in the first person perspective in order to provide the individual with ASD cues on how to act appropriately in particular social situations (Wong et al., 2014). Social Stories™ are the most well-known story-based interventions.

Other strategies such as prompting, reinforcement, etc. may be used with story-based interventions (NAC, 2009).

2.3 Treatment Planning

ASHA has identified *many* EB methods, strategies, and procedures for different aspects of autism across the lifespan; however, this paper addresses EBP and EB interventions for social-communication deficits. Among other EBPs, ASHA has included the following EBPs in regard to planning interventions for such social-communication deficits: 1) Increasing attention to social stimuli, imitation skills, communication and language (particularly use of language in social situations), symbolic play, and social relationships should be addressed in comprehensive programs (New York State Department of Health, Early Intervention Program (NYSDH EIP), 1999 in ASHA, 2015), 2) Early intervention assists in the development of communication skills in children with ASD (NICE, 2012 in ASHA, 2015), and 3) Communication should be a high priority, and all children/young people with ASD should have communication goals (MHE, 2008 in ASHA, 2015).

As stated at the beginning of this discussion, individuals with ASD must cope with social-communication deficits throughout the lifespan. Children with ASD will become adults with ASD (Donvan & Zucker, 2010). A plethora of information exists on interventions for individuals with ASD, so how are decisions made as to which intervention(s) to use with particular children with ASD? Within the school setting, the Individualized Education Program (IEP) team is ultimately responsible for the skills to teach, and the education of IEP team members on appropriate social-communication goal selection is ultimately the responsibility of the school-based SLP.

Aman (2005) suggests that clinicians and families (and really all stakeholders) *conceptualize treatment planning within a life-stage framework* since the needs of the individual with ASD are ever-evolving. White, Scahill, Klin, Koenig, and Volkmar (2007) indicate that children with ASD require a continuum of services and placement options. Campbell, Magda, Schopler, Cueva, and Hallin (1996) stated that treatment should be exhaustive and fashioned to the needs and level of functioning for each individual.

Another responsibility of stakeholders and planning team members (particularly that of the SLP) (ASHA, 2006) is *advocating with, and sometimes for, the individual with ASD*. Knowledge of federal and state laws protecting the rights of individuals with disabilities can improve advocacy efforts in educational and community settings.

Coppage and Veal (1979) studied a 6-year-old male with autism as he participated in a cooperative approach to intervention for 2 ½ years. The intervention team members consisted of a teacher of the emotionally disturbed, a speech pathologist, and the child's parents. Coppage and Veal (1979) determined that positive behavior and language changes are more likely to occur when professionals and parents *merge and fully participate* in the treatment program.

"Treatment selection is complicated" (NAC, 2009, p. 55), and individuals with ASD respond differently to intervention; however, the Ziggurat Model developed by Aspy and Grossman (2008) may provide the comprehensive life-long team framework that the literature for ASD has been lacking. The Ziggurat Model *holds paramount the individuality* of the person with ASD as assessments consider strengths, social characteristics, restricted patterns of behavior, interests, and activities, communication

characteristics, sensory differences, cognitive differences, motor differences, emotional vulnerability, and known medical or other biological factors.

2.4 Ziggurat Model

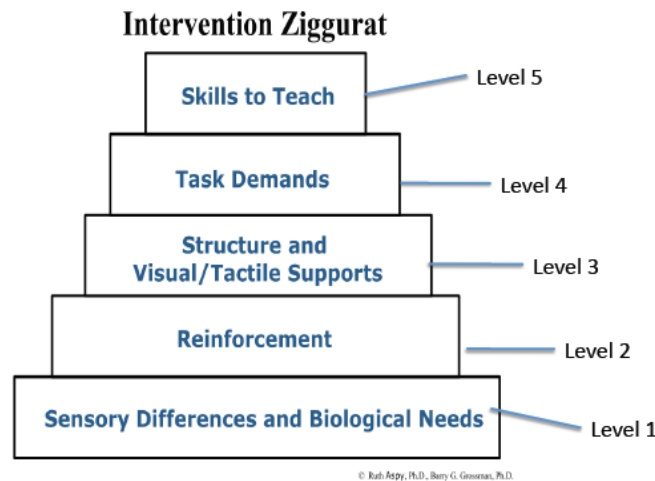
The text, *Designing Comprehensive Interventions for Individuals with High-Functioning Autism and Asperger Syndrome: The Ziggurat Model*, (Aspy & Grossman, 2008) introduced a comprehensive model for teaching new skills to individuals with ASD. This book introduced the assessment tools used in the Ziggurat Model to evaluate the underlying characteristics of autism—the Underlying Characteristics Checklist (UCC), the Individual Strengths and Skills Inventory (ISSI), and the ABC-Iceberg (ABC-I) (Aspy & Grossman, 2008). It also provided a guide for the intervention planning process (the Ziggurat Worksheet) using the five levels of the Intervention Ziggurat, which is the centerpiece of the Ziggurat Model (Aspy & Grossman, 2008). The Ziggurat Model is appropriate for comprehensive planning or planning for a specific skill. The ultimate product of the Ziggurat Model is the Comprehensive Autism Planning System (CAPS) (Henry & Myles, 2007). The CAPS is a visual, physical plan that follows a student in any aspect of the school day. The plan includes a visual schedule and specifics of any supports a student may need.

The main idea of the Ziggurat Model is:

[ASD is a] lifelong [condition] that [requires] intervention throughout the lifespan. Only when the sensory system is calm, reinforcement is available, the environment is made predictable through structure and visual/tactile supports, and task demands are carefully designed [can] skills be effectively taught and demonstrated (Aspy & Grossman, 2008, p. 82).

Figure 2.1 displays the Intervention Ziggurat, consisting of five levels, comprised of some of the most proven strategies in autism literature.

Figure 2.1: The Ziggurat Model



The foundational level of the Ziggurat Model is Sensory Differences and Biological Needs. This level addresses the biology of the individual, regarding motor and sensory functioning (Aspy & Grossman, 2008). Individuals with ASD may exhibit difficulty with gross motor tasks. Another example at this foundational level may be hypersensitivity to sound. Sensory interventions can be used to target sensory differences.

2.4.1 Sensory Interventions

A. Jean Ayers developed sensory integration (SI) theory (Ayers, 1979) to explain how the brain processes sensory input. Activities of SI therapy are designed to organize information from the environment (Baranck, 2002 in Pfeiffer, Koenig, Kinnealey, Sheppard, & Henderson, 2011). A sensory diet (Fazlioglu & Baran, 2008) is a “schedule of frequent and systematically applied somatosensory stimulation... followed by a prescribed set of activities designed to meet the child’s sensory needs and integrated into

the child's daily routine" (p. 418). Touch therapy has been considered by some to be an SI intervention (Field et al., 1997). Touch therapy is concerned with specific patterns of stroking movements (Field et al., 1997). While SI interventions show promise and are widely used, they are not yet considered EBP (Wong et al., 2014; NAC, 2009).

The next level of the Ziggurat Model is Reinforcement, which is required for teaching any new skill and for maintaining skills previously acquired (Aspy & Grossman, 2008). Reinforcement concerns the motivation of the individual with ASD. Individuals with ASD exhibit restricted interests, which may be considered as reinforcement for them to complete a desired activity. Prompting and reinforcement have been successful in answering questions (Tramontana & Stimbert, 1970; Handleman, 1979; McMorro & Foxx, 1986; Secan, Egel, & Tilley, 1989; and Marchese, Carr, LeBlanc, Rosati, & Conroy, 2012), asking questions (Williams, Perez-Gonzalez, & Vogt, 2003), producing functional speech (Ross & Greer, 2003), requesting assistance (Reichle, Dropik, Alden-Anderson, & Haley, 2008), and using gestures and producing verbal responses (Buffington, Krantz, McClannahan, & Poulson, 1998).

The third level of the Ziggurat Model is made up of Structure and Visual/Tactile Supports. Visual supports are "concrete cues that provide information about an activity, routine, or expectation and/or support skill demonstration" (Hume, 2013). This level is important based on an individual with ASD needing routine order and lacking verbal communication skills (Aspy & Grossman, 2008). Many individuals with ASD also demonstrate strengths in visual skills, further supporting the use of visual supports. An example of a visual support is a visual schedule, which enables the individual to see the entire sequence of expected events (a predictable environment). Eighteen studies support

visual supports as an evidence-based practice and prove visual supports can “be used effectively to address [social-communication], behavior, play, cognitive, school-readiness, academics, motor, and adaptive skills” (Hume, 2013 in Wong et al., 2014).

The fourth level is Task Demands. Incorporating this level of the pyramid ensures that the teacher, parent, or interventionist is not teaching at a level too high or too low for the individual with ASD. The Task Demands are a continuum, ever changing to meet the needs of the individual with ASD (Aspy & Grossman, 2008). If the individual is not working within his or her zone of proximal development, then frustration will likely result on the part of the individual, clinician, or both. Vygotsky (1978) introduced zone of proximal development as “the distance between what a child can independently perform (the actual development level) and the maximum that a child can achieve under guidance (the potential development level)” (Mestad & Kolsto, 2014, p. 1055).

The final, or top level of the Ziggurat Model consists of the Skills to Teach for the particular individual with ASD. The student’s Individualized Education Program (IEP) team selects these skills to teach based upon the student’s present levels of performance. In particular, the student’s SLP plays the lead role in the selection of targeted social communication skills. The SLP is also responsible for the training of staff to reinforce target skills.

Each preceding level of the Ziggurat Model must be addressed before moving onto the next to maintain intervention effectiveness and to ensure development of new skills (Aspy & Grossman, 2008). The Comprehensive Autism Planning System (CAPS) (Henry & Myles, 2007) accompanies the Intervention Ziggurat. The CAPS is also developed by the IEP team and “provides an overview of a student’s daily schedule by

time and activity as well as the supports he needs during that period” (Henry & Myles, 2007, p. 12).

2.4.2 Research on the Ziggurat Model

While the published text for the Ziggurat Model is relatively new, the concepts that make up the model itself are cited as far back as the early 1970s. Each level of the Ziggurat Model is based upon both promising and proven widely used techniques explained by Aspy and Grossman (2008). Despite the levels of the Ziggurat Model being supported in the literature, use of the model as a whole is in the beginning stages of published research.

Myles, Grossman, Aspy, Henry, and Coffin (2007) reported using the Ziggurat Model and CAPS (Henry & Myles, 2007) with a 16-year-old sophomore with autism. Results of the case study showed the student increased his time in the general education setting, had greater access to the general education curriculum, had increased participation with peers and teachers, and had skill acquisition (Myles et al., 2007). This case study is also provided on the Ziggurat Group website as an example of success (Ziggurat Group, 2012). Smith, Myles, Aspy, Grossman, and Henry (2010) reported more case studies; however, no follow-up assessments or results were reported on these case studies in this publication. The Ziggurat Group reports on their website that their model is currently being applied through the Ohio Center for Autism and Low Incidence (OCALI), the University of New Mexico Center for Development and Disability (CDD), and through educators in Ohio, Kansas, Arizona, and Minnesota (Ziggurat Group, 2012).

Wilkerson, Wittman, and Page (2011) conducted a preliminary qualitative study using the Ziggurat Model. Three school-based speech-language clinicians and speech-

language teachers in Tennessee were recruited to participate in 45-minute semi-structured interviews and artifact collection. Results demonstrated that: 1) situations in school systems may not be ideal, but therapists need to use their ingenuity and knowledge of evidence-based practice to create the optimum learning experience for individuals with ASD, and 2) these school-based clinicians incorporated different levels of the Ziggurat Model, but they seemed unaware (as a group) of the significance of how the levels work together in teaching children with ASD (Wilkerson, Wittman, & Page, 2011).

Past research proves gaps exist between SLP knowledge of ASD and practice (Schwartz & Drager, 2008; Price et al., 2009; Wilkerson et al, 2011; Wong et al, 2014). The following study was designed to investigate the effects of an online training using the Ziggurat Model on school-based clinicians' knowledge about supports available for individuals with ASD. The research question was, "Does the ASD knowledge base of ASHA-certified school-based SLPs change when they complete an online training module based upon Aspy and Grossman's Ziggurat Model? If so, what are those changes?"

Chapter 3 Methods

The University of Kentucky Institutional Review Board (IRB) approved the methods employed in this study.

3.1 Experimental Design

A mixed methods research design was utilized to investigate the following research question: “Does the ASD knowledge base of ASHA-certified school-based SLPs change when they complete an online training module based upon Aspy and Grossman’s Ziggurat Model? If so, what are those changes?” To determine whether a change existed, a pre-test post-test control group design was applied. The experimental group of SLPs participated in an online module addressing comprehensive planning for individuals with ASD. All participants completed a survey prior to and following the intervention phase of the study. It was hypothesized that a significant change would occur from pre to post measurement within the experimental group, and that a significant difference would exist between the experimental group and the control group at post-measurement. The online module additionally required participation in a two-week discussion period after completion of the module content. Information collected from the discussion period was analyzed for overall themes.

3.1.1 Participants

To be eligible to participate in the study, individuals were required to 1) be ASHA-certified SLPs, 2) work in a school setting, 3) speak English, and 4) work with at least one child with ASD while enrolled. These parameters ensured that participants were nationally certified SLPs, which prevented speech assistants and educational

assistants from participating. The investigation focused on the school setting since that is the most populous location in which SLPs serve children with ASD. The investigator asked that participants speak English since the intervention and discussion boards were provided in English. The requirement of working with at least one child with ASD ensured that participants had a real-life example with which to relate the information, helping address adult learning needs for application.

Appendices B and C display the brochure and participant letter by which ASHA-certified school-based SLPs were recruited to participate in this study. The brochure and the participant letter were posted on the ASHA Special Interest Group (SIG) for School-Based SLPs community board. The online SIG recruitment was chosen as the best means to target SLPs in the schools. The investigator's membership in this SIG permitted direct access to school-based SLPs with interest and experience treating students with ASD.

After viewing the online brochure, interested participants were asked to contact the investigator via the SIG online community or via e-mail. The investigator's online community settings were set to send an e-mail alert in case of a message. Once the participants communicated interest, the investigator sent a personal e-mail with the participant letter attached to ensure participants fully understood the expectations of the study. This letter was also posted on the community site. Participants were encouraged to ask questions prior to and throughout the study. Participants were also reminded that they could withdraw from the study at any time, by simply stating they desired to do so. Reading the participant letter and notifying the researcher that one desired to participate sufficed as participants' consent.

Twenty school-based SLPs who met all four of the study requirements participated in the study. Initially, fifty-three SLPs expressed interest in the study. One of the fifty-three prospects did not qualify for the study, as she was not employed in a school system. Another was not eligible because she did not have any students with ASD on her caseload. An additional fifteen prospects did not respond to follow-up e-mails or messages on the community site. Three additional prospects chose not to participate due to “not having enough time.” Ten more did not complete the pre-test (online survey), leaving twenty-six participants. The investigator used computer randomization (SAS ProPlan) to assign the remaining twenty-six participants to the experimental group, who would participate in the online training, or the control group, participants who would not participate in the online training. After this randomization was completed, six additional prospects failed to complete the second step of the study, which was participation in the first of two discussion periods, despite e-mail reminders from the researcher. These participants were then withdrawn from the study, leaving twenty participants. These withdrawals created an imbalance in the two groups, leaving eight SLPs in the experimental group and twelve in the control group. Because the study had already commenced, no attempt was made to equalize the groups.

3.1.2 Materials

3.1.2.1 Autism Knowledge Survey

Appendix D presents the Autism Knowledge Survey (AKS), designed using REDcap. Participants in both the experimental group and the control group completed the AKS at the pre-intervention stage.

REDCap (Research Electronic Data Capture) is a secure, web-based application designed exclusively to support data capture for research studies. REDCap provides: 1) an intuitive interface for data entry (with data validation); 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages (SPSS, SAS, Stata, R); 4) procedures for importing data from external sources; and 5) advanced features, such as branching logic and calculated fields (University of Kentucky, 2013, paragraph 1).

A draft version of the Autism Knowledge Survey (AKS) was administered to a focus group for validation purposes in May 2013. This focus group consisted of students in the Communication Disorders Master's degree program at a regional comprehensive university in a rural state. This group of students had recently completed the requirements for a certificate in Autism Spectrum Disorder. This certificate program included information on the Ziggurat Model as a component of instruction; therefore, these focus group participants were considered *experts*. The group made the following recommendations: 1) items need to be challenging enough to show a change from pre to post, 2) consider revisiting the Ohio Center for Autism and Low Incidence (OCALI) online module to design deeper questions, and 3) add a few short answer or qualitative items to make the participants apply the Ziggurat Model knowledge. The survey was modified to reflect these suggestions and re-presented to the original focus group for approval.

The AKS consisted of three sections: Demographics, Confidence in Competence Rating, and Questions about ASD. The AKS requested eleven demographics from

participants (Participants could choose to skip any question.): 1) contact information, including first and last name, address, telephone number, e-mail address, 2) age, 3) gender, 4) number of years practicing as an SLP, 5) highest degree earned, 6) date of highest degree earned, 7) number of years experience with students with ASD, 8) percentage of student population with a diagnosis of ASD, 9) whether continuing education credits related to ASD had been obtained since highest degree, 10) how many hours of continuing education completed in the area of ASD, and 11) knowledge of Aspy and Grossman's Ziggurat Model.

Participants were also asked to use a visual sliding scale to indicate where they ranked themselves on a scale ranging from strongly disagree (rating of 0) to strongly agree (rating of 100) with this statement: "I feel competent I have enough clinical and educational training to deliver effective services to children with autism."

The final section of the AKS consisted of twenty multiple-choice questions regarding autism, mainly within the context of a school environment. The AKS required about 15-20 minutes each time it was completed.

3.1.2.2 OCALI AIM and Online Discussion

Developed by the OCALI in partnership with the Autism Society of America (ASA), the Nebraska Autism Spectrum Disorders Network, the National Professional Development Center on Autism Spectrum Disorders and Toronto's Geneva Centre for Autism, the Autism Internet Modules (AIM) project was begun in 2007.

All module content has been written by ASD experts from across the U.S., including the Arizona Department of Education, the Indiana Resource Center for Autism, and the University of Miami Center for Autism and Related Disorders. In

addition, OCALI staff members have designed each module to be consistent with research on [*how adults learn*]; information is presented at a universal reading level, and [*interactive activities*] both reinforce knowledge and teach learners how to make the latest research [*applicable to real life*] (OCALI, 2013).

OCALI has developed a free Autism Internet Module (AIM), titled “Comprehensive Program Planning for Individuals With Autism Spectrum Disorders” to teach Apsy and Grossman’s (2008) Ziggurat Model. The module includes narratives, case studies, video clips, and examples in an asynchronous format.

Even though 79% of school-based SLPs preferred local in-person conference professional development over an online conference with multiple sessions (16.7%), online self-study (35.2%), or an online webinar (32.2%) (ASHA, 2013), the investigator chose to provide this online intervention because it is a widely available resource and covers relevant material about the Ziggurat Model. The investigator obtained permission via e-mail to use the “Comprehensive Program Planning for Individuals With Autism Spectrum Disorders” module for this study (S. Smith, personal communication, 2014). Participants were awarded a continuing education certificate for completion of the OCALI module and ensuing discussion period, worth 2.0 credits.

3.1.2.3 Google/OCALI Accounts

A Google e-mail account and an OCALI account were required for participation. Both accounts were free and accessible from any computer with an Internet connection.

Application of the OCALI AIM content was evaluated based on responses in the discussion portion of the intervention, conducted via Google Groups. There were two open-ended discussion questions, requiring participants to relate the AIM content to their

practice in the schools. The discussion questions were: 1) “How do you, as a school-based SLP plan to incorporate use of the Underlying Characteristics Checklist (UCC), the Individual Strengths and Skills Inventory (ISSI), and/or ABC-Iceberg in your assessments/re-evaluations of individuals with ASD? What is your hope/goal for sharing the idea of comprehensive planning with your colleagues -- SLPs or other professionals?” and 2) “Describe two roadblocks/obstacles you anticipate with incorporating comprehensive assessment and planning in your school-based practice. How will you overcome those two difficulties?”

3.2 Procedures

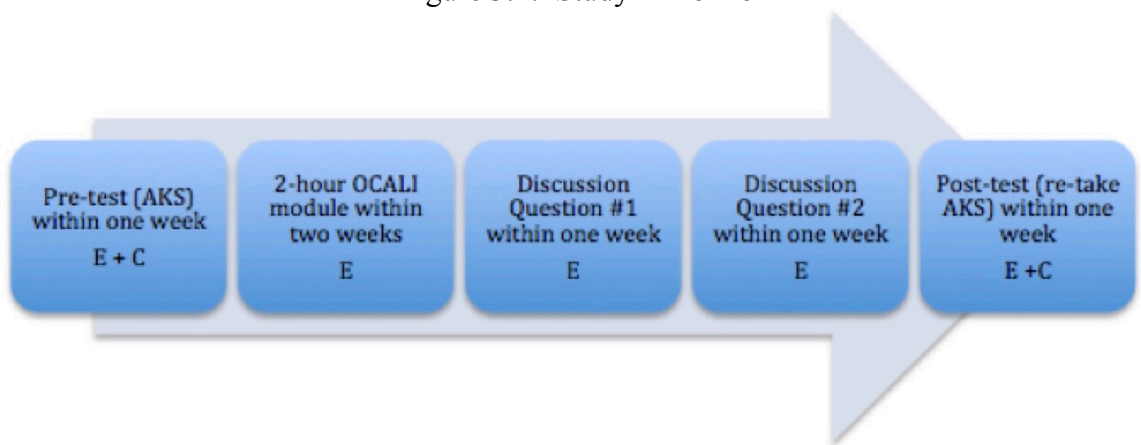
Figure 3.1 shows a chronological timeline for the study procedures. Participants in both the experimental and the control groups were asked to complete the pre-test AKS within a one-week timeframe. Participants were allowed to skip any question on the AKS. After completing the AKS, the experimental group was asked to complete a two-hour online training (OCALI, 2015) within the next two weeks. The course was asynchronous so that participants could access the information at all times, at their convenience.

During the first week following completion of the OCALI AIM, the experimental group was asked to respond to Discussion Question One: “How do you, as a school-based SLP plan to incorporate use of the Underlying Characteristics Checklist (UCC), the Individual Strengths and Skills Inventory (ISSI), and/or ABC-Iceberg in your assessments/re-evaluations of individuals with ASD? What is your hope/goal for sharing the idea of comprehensive planning with your colleagues -- SLPs or other professionals?” During the second week after OCALI online module completion, participants in the

experimental group were asked to respond to Discussion Question Two: “Describe two roadblocks/obstacles you anticipate with incorporating comprehensive assessment and planning in your school-based practice. How will you overcome those two difficulties?”

Participants had one week to complete each discussion question. In order to ensure ongoing discussion, participants were required to submit a total of three different responses to each discussion question. To ensure participant interaction with the material more than once weekly, participants were asked to return to the discussion three times to complete the following tasks: 1) respond to the investigator’s question and 2) respond to two different participants’ responses. During the week immediately following completion of the intervention phase, both the experimental and control groups were asked to retake the AKS. The control group was then given the opportunity to participate in the online training, including the OCALI module and ensuing discussion. This participation was completely voluntary and results were not tracked for inclusion in this study.

Figure 3.1: Study Timeline



3.3 Data Coding and Analysis

3.3.1 Quantitative

3.3.1.1 AKS -- Demographics

The REDCap portal in which the AKS was housed was used to generate reports for each demographic question. IBM SPSS 22 Statistical Software was employed to calculate statistical tests between demographics and the change in Autism Knowledge Survey (AKS) scores from pre-test to post-test for all participants.

3.3.1.2 AKS -- Confidence in Competence

The investigator used IBM SPSS 22 Statistical Software to investigate relationships between all demographics and the change in confidence rating scores from pre-test to post-test for all participants.

3.3.1.3 AKS -- ASD Questions

Responses to the ASD questions in REDCap were converted and entered into IBM SPSS Statistical Software 22 in order to calculate total scores for each pre-test and post-test. An independent samples t-test was used to examine the difference between the experimental group's and the control group's pre-test and post-test scores. The experimental group's pre-test and post-test scores were compared using a one-sample t-test. The control group's pre-test and post-test scores were also compared using a one-sample t-test. The experimental group's pre-test responses were compared to their post-test responses to identify areas in which ASD knowledge changed.

3.3.2 Qualitative

3.3.2.1 Discussion Questions

The investigator analyzed responses to the two open-ended discussion questions following the data analysis spiral (Creswell, 2007). Data were exported to an Excel spreadsheet and analyzed by hand. The investigator read the transcripts twice in their

entirety, and then, identified major organizing ideas. The investigator composed names of codes to describe words, phrases, and sentences. Axial coding was then used to link larger categories and smaller categories. Selective coding resulted in development of six themes.

Creswell (2007) recommended that researchers participate in at least two validation strategies. In the first strategy, participants were asked to complete member checks to indicate whether they agreed/disagreed with the investigator's conclusions. Specifically, participants were asked to revisit the Google Group to compare the data with the investigator's overall themes. The second strategy of validation used was that of clarifying researcher bias. The researcher chose Aspy and Grossman's Ziggurat Model as the intervention for this study due to previous experience with the model. The investigator completed a certificate program in Autism Spectrum Disorder at a regional comprehensive university in a rural state, which included the Ziggurat Model as a component of instruction.

In order to address reliability, an expert in qualitative data analysis was asked to independently analyze the samples and then compare codes and themes with those of the investigator. Inter-coder reliability was calculated for codes by means of Cohen's kappa statistic.

Chapter 4 Results

A mixed methods design investigated the following research questions: “Does the ASD knowledge base of ASHA-certified school-based SLPs change when they complete an online training module based upon Aspy and Grossman’s Ziggurat Model? If so, what are those changes?”

4.1 Quantitative Findings

4.1.1 Sample Size and Attrition

The study began with 26 participants, but six participants withdrew. Twenty school-based ASHA-certified SLPs completed the study. The attrition rate for the study was 23%. As a result of the attrition, this sample size was lower than originally planned.

4.1.2 AKS-Participant Demographics

4.1.2.1 Gender, Age, and Geography

All twenty participants indicated they were female. Figure 4.1 shows the age of participants, ranging from twenty years to sixty-seven years. The largest number of participants (8), were ages twenty to thirty-five. Six participants were ages thirty-six to fifty-one, and six participants were ages fifty-two to sixty-seven. No participants were sixty-eight years or older. Figure 4.2 shows the age of participants divided by group.

Figure 4.1: Age of Participants

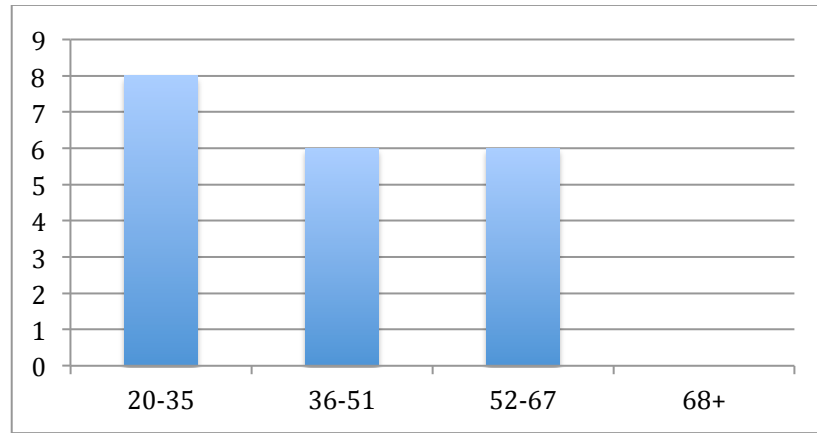


Figure 4.2: Age of Participants by Group

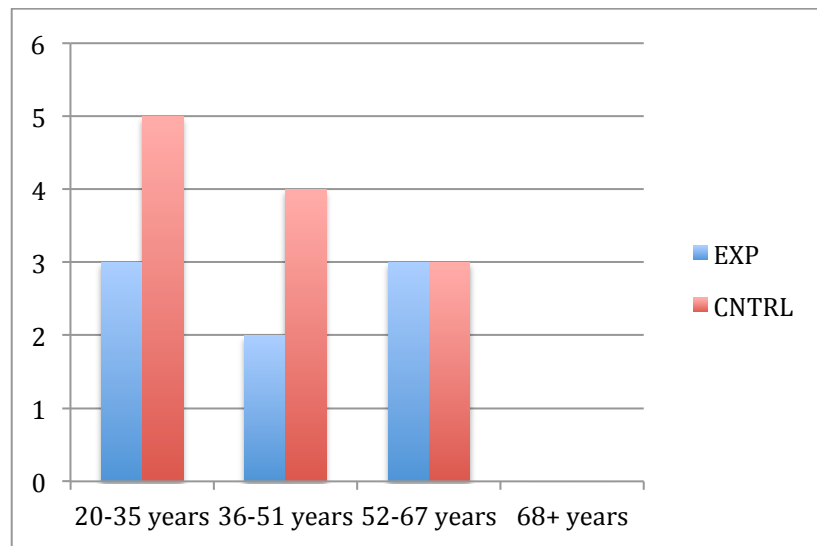


Table 4.1 shows the analysis of variance (ANOVA) for the age of participants and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value ($.498 < 1.96$). The significance level of $.617$ is greater than $.05$, so there are no significant differences in the mean for post-test scores between the three age groups.

Table 4.1: ANOVA for Age and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	5.133	2	2.567	.498	.617
Within Groups	87.667	17	5.157		
Total	92.800	19			

Figure 4.3 shows the geographical location of participants. The largest number of participants (16) reported working in a suburban area. Two participants worked in urban areas, and two participants worked in rural areas. Figure 4.4 shows the geographical location of participants by group.

Figure 4.3: Geographical Location of Participants

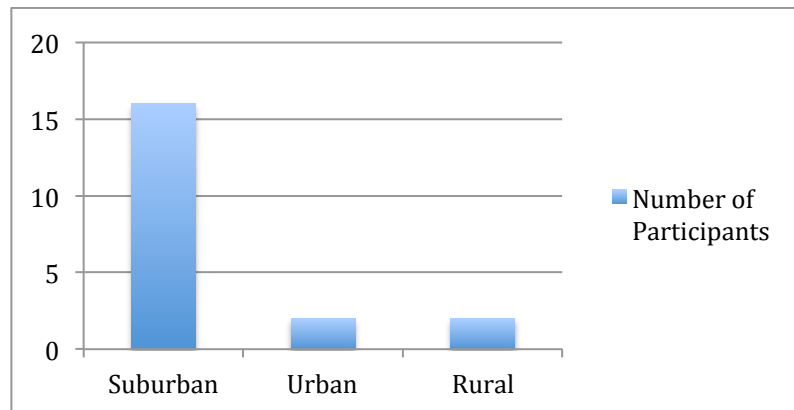


Figure 4.4: Geographical Location of Participants by Group

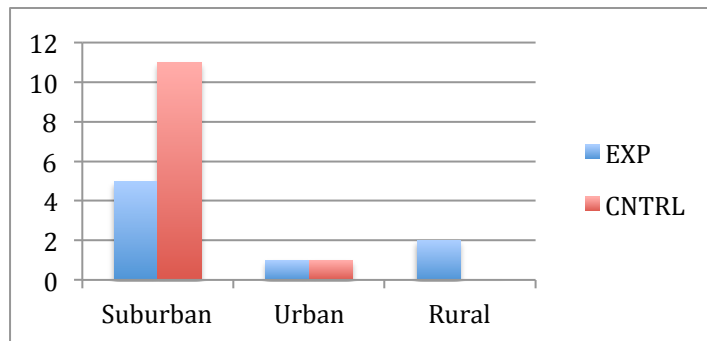


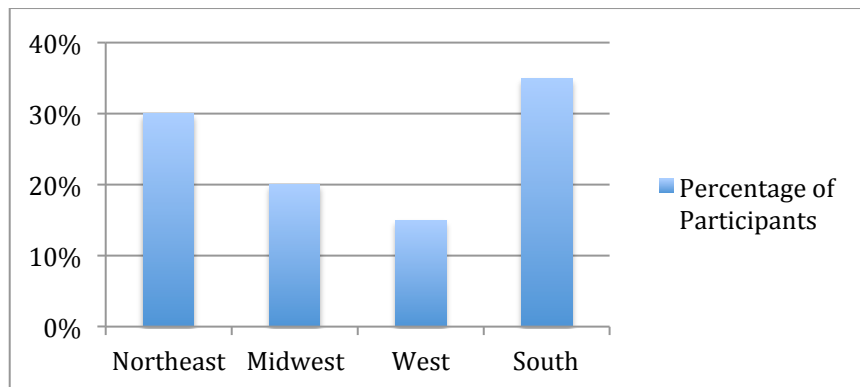
Table 4.2 shows the ANOVA for the geographical location of participants and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value ($1.391 < 1.96$). The significance level of .276 is greater than .05, so there are no significant differences in the mean for post-test scores between the geographical locations of participants.

Table 4.2: ANOVA for Geographical Location and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	13.050	2	6.525	1.391	.276
Within Groups	79.750	17	4.691		
Total	92.800	19			

Figure 4.5 shows the locations where participants were employed. Thirty percent of participants worked in the Northeast, 20% worked in the Midwest, and 15% worked in the West. The largest number of participants (35%) worked in the South.

Figure 4.5: Locations of Participants' Employers by Region



4.1.2.2 Practice Experience and Education

Figure 4.6 illustrates how many years each participant had practiced in the field of speech-language pathology. The largest number of participants had practiced twenty-one to thirty years (6), followed by 0-5 years (5). Four participants had practiced for 6-10 years, and four participants had practiced eleven to twenty years. One participant had practiced for thirty-one to forty years. School-based SLPs on the ASHA Membership Survey (ASHA, 2013) had been practicing for an average of 18 years (median 16 years). Figure 4.7 shows how many years each participant had practiced in the field of speech-language pathology by group.

Figure 4.6: Participants' Experience

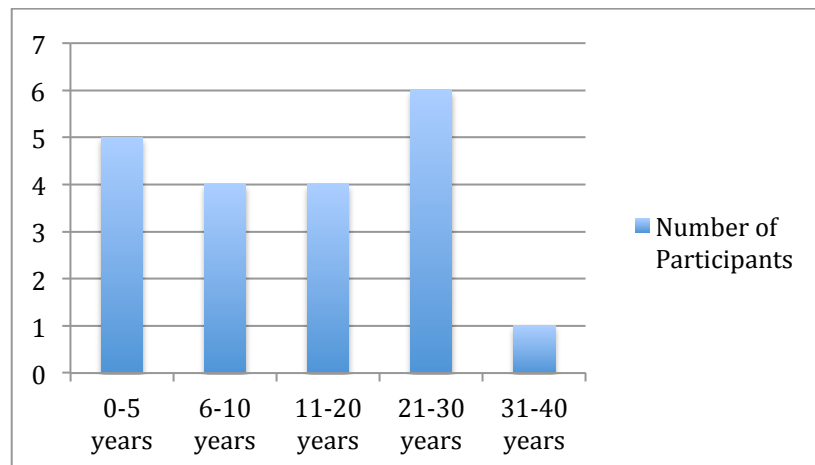


Figure 4.7: Participants' Experience by Group

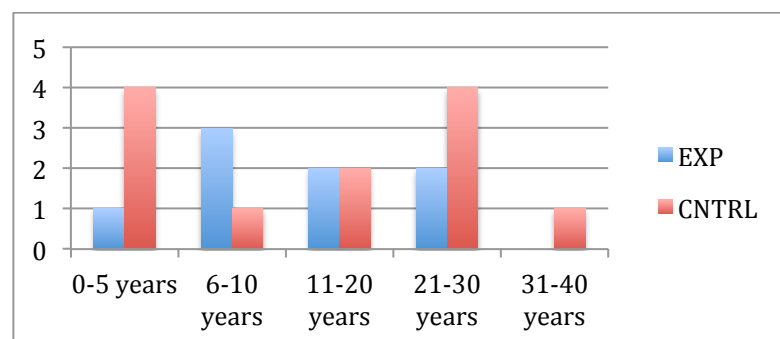


Table 4.3 shows the ANOVA for participants' years of practice as an SLP and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value ($.718 < 1.96$). The significance level of .593 is greater than .05, so there are no significant differences in the mean for post-test scores between the different amounts of work experience.

Table 4.3: ANOVA for Years Practiced and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	14.917	4	3.729	.718	.593
Within Groups	77.883	15	5.192		
Total	92.800	19			

Figure 4.8 illustrates participants' years of experience with individuals with ASD. The largest number of participants in this study (8) had zero to five years experience with students with ASD, followed by six participants with 6-10 years experience with students with ASD. Five participants reported having eleven to twenty years experience with students with ASD, and one participant reported having thirty-one to forty years experience with students with ASD. No participants reported working with students with ASD for twenty-one to thirty years. Figure 4.9 illustrates participants' years of experience with individuals with ASD by group.

Figure 4.8: Years Experience with ASD

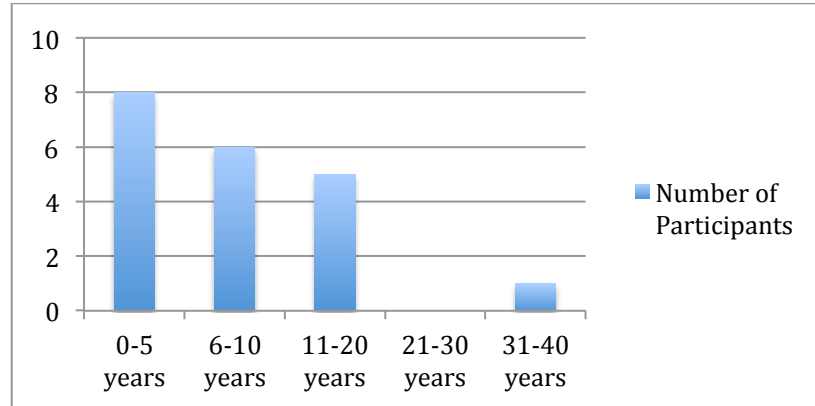


Figure 4.9: Years Experience with ASD by Group

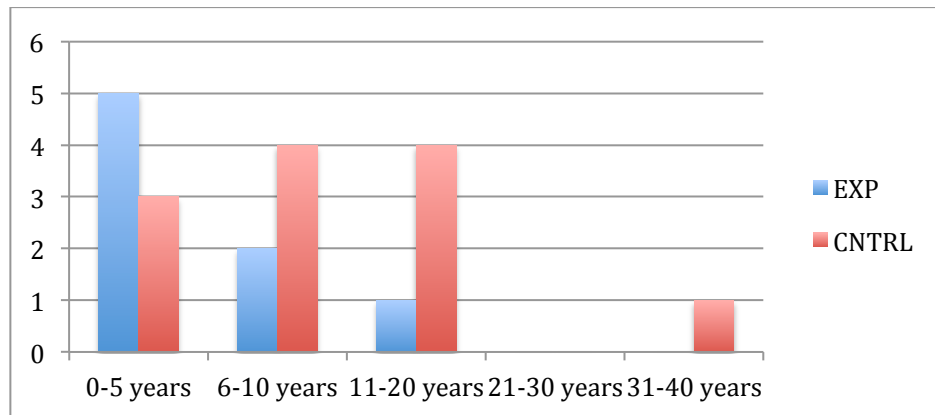


Table 4.4 shows the ANOVA for participants' years of experience with students with ASD and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value (.186<1.96). The significance level of .904 is greater than .05, so there are no significant differences in the mean for post-test scores between the different amounts of experience with ASD.

Table 4.4: ANOVA for Years Experience with Students with ASD and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	3.125	3	1.042	.186	.904
Within Groups	89.675	16	5.605		
Total	92.800	19			

Figure 4.10 presents the percentages of individuals with ASD on participants' caseloads. The largest number of participants demonstrated a low percentage of students with ASD on their caseloads. Thirteen participants reported 0-25% of students with ASD on their caseloads. Three participants indicated their caseload was comprised of 26-50% of students with ASD, two participants reported 51-75% of their caseloads as students with ASD, and two participants related 76-100% of their caseloads were students with ASD. Figure 4.11 shows the percentage of individuals with ASD on participants' caseloads by group.

Figure 4.10: Percentage of ASD on Caseload

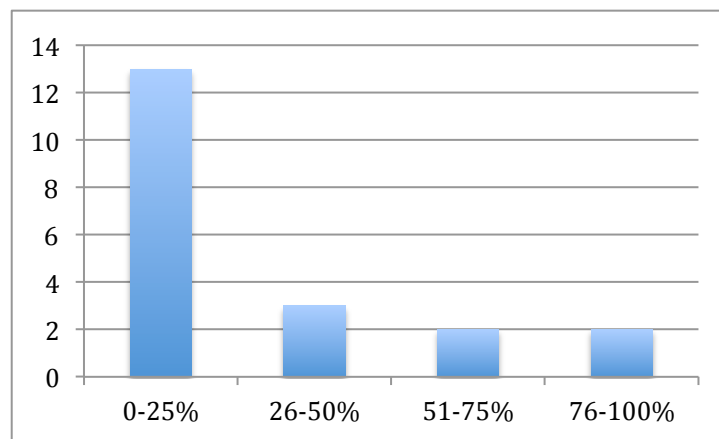


Figure 4.11: Percentage of ASD on Caseload by Group

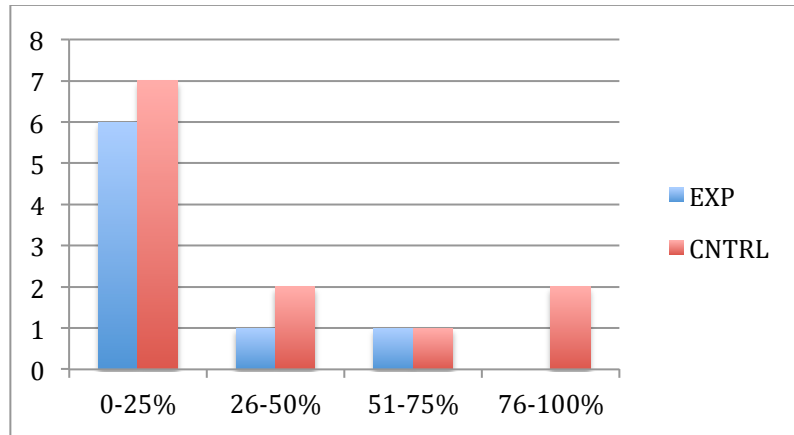


Table 4.5 shows the ANOVA for percentage of students with ASD on caseload and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value (.201<1.96). The significance level of .894 is greater than .05, so there are no significant differences in the mean for post-test scores between the different percentages of students with ASD on caseload.

Table 4.5: ANOVA for Students with ASD on Caseload and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	3.364	3	1.121	.201	.894
Within Groups	89.436	16	5.590		
Total	92.800	19			

Figure 4.12 shows the education level of participants. Two participants had obtained doctoral degrees, five participants had obtained a master's degree plus thirty additional hours, and the largest number of participants (12) had obtained a masters

degree. One participant chose not to respond to this question. Figure 4.13 shows the education level of participants by group.

Figure 4.12: Education Level of Participants

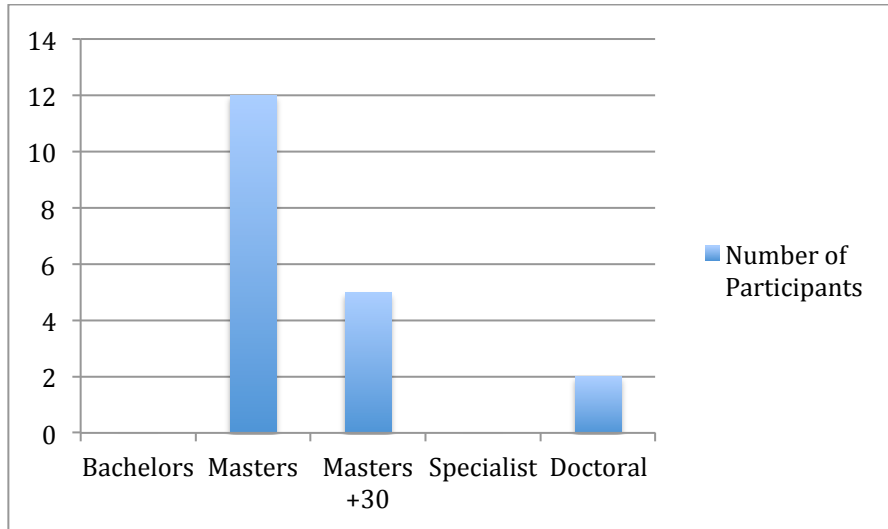


Figure 4.13: Education Level of Participants by Group

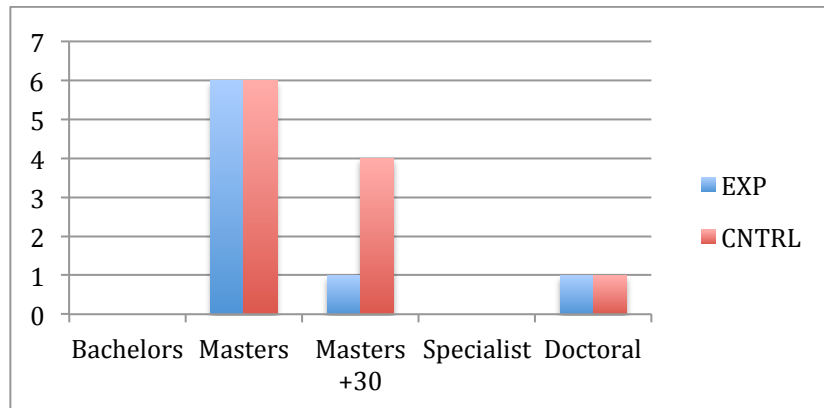


Table 4.6 shows the ANOVA for highest degree obtained and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value (.106 < 1.96). The significance level of .900 is greater than .05, so there are no significant differences in the mean for post-test scores between the highest degree obtained.

Table 4.6: ANOVA for Highest Degree and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	1.215	2	.607	.106	.900
Within Groups	91.417	16	5.714		
Total	92.632	18			

Figure 4.14 displays the timeframe for the participants' highest degree earned.

The majority of participants (7) earned their highest degree from 1990-1999, followed by six participants earning their highest degrees from 2000-2009, and then five participants earning their highest degrees from 2010-present. Two participants earned their highest degrees from 1980-1989, and no participants earned their highest degree before 1979.

Figure 4.15 displays the timeframe for the participants' highest degree earned by group.

Figure 4.14: Timeframe of Education

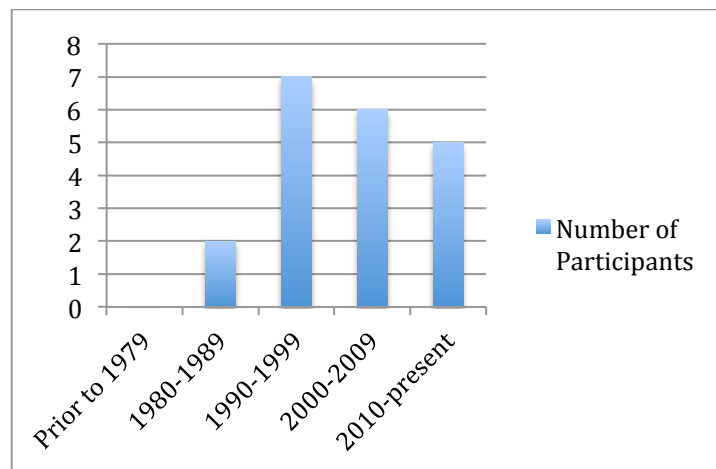


Figure 4.15: Timeframe of Education by Group

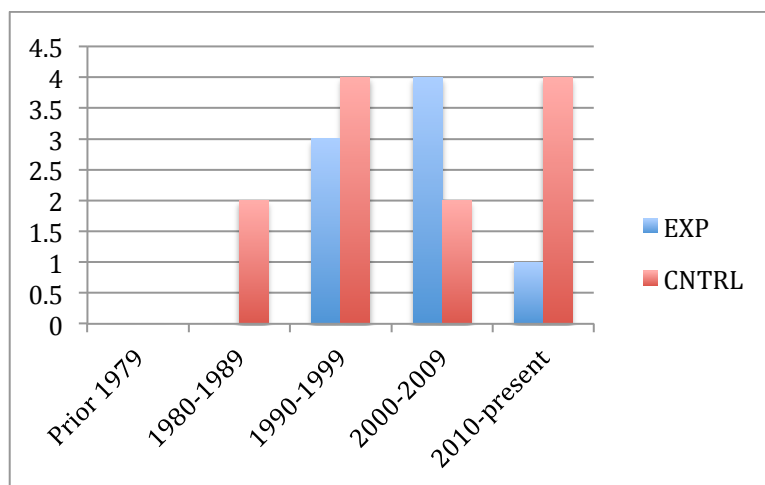


Table 4.7 shows the ANOVA for the timeframe of highest degree obtained and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value (.152<1.96). The significance level of .927 is greater than .05, so there are no significant differences in the mean for post-test scores between the timeframe of highest degree obtained.

Table 4.7: ANOVA for Degree Timeframe and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	2.571	3	.857	.152	.927
Within Groups	90.229	16	5.639		
Total	92.800	19			

4.1.2.3 Continuing Education

Fifteen participants stated they had completed continuing education hours in the area of ASD since receiving their highest degree. Five participants stated they had not

obtained any continuing education credits related to ASD since receiving their highest degree.

Figure 4.16 shows participants' continuing education hours in ASD. Eight participants had completed 16 or more hours of continuing education in the area of ASD. Four participants had completed 6-10 hours of continuing education in the area of ASD, and three participants had completed 1-5 hours. No participants had completed 11-15 hours. Eighteen participants reported they had never heard of Aspy and Grossman's (2008) Ziggurat Model, and two participants reported they had heard of it but had no additional experience with the model. Figure 4.17 shows participants' continuing education hours in ASD by group.

Figure 4.16: Continuing Education in ASD

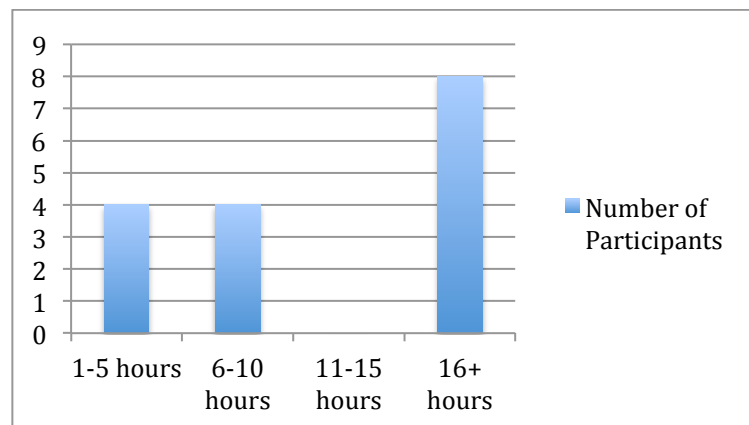


Figure 4.17: Continuing Education in ASD by Group

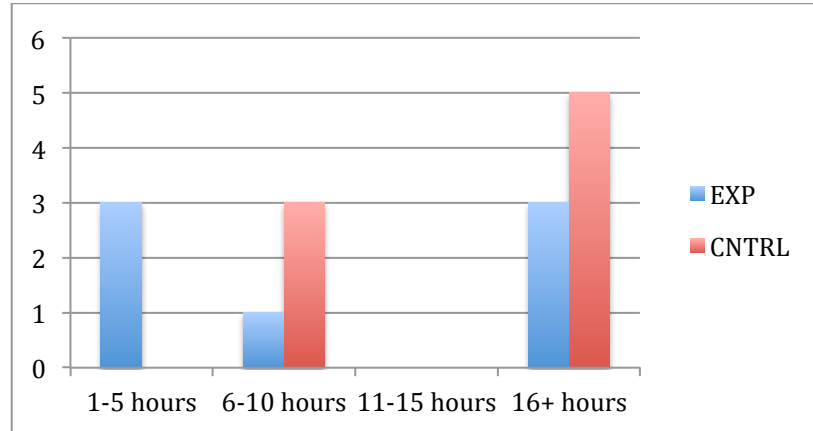


Table 4.8 shows the ANOVA for continuing education hours in ASD obtained since highest degree and difference in AKS total score (Post-Pre). The F test statistic is less than the critical F-value (.209<1.96). The significance level of .653 is greater than .05, so there are no significant differences in the mean for post-test scores between continuing education hours obtained.

Table 4.8: ANOVA for Continuing Education and Difference in Pre-Post Test AKS Scores

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	1.067	1	1.067	.209	.653
Within Groups	91.733	18	5.096		
Total	92.800	19			

4.1.2.4 Confidence in Service Delivery

As one question on the Autism Knowledge Survey (AKS), participants were asked to agree or disagree with the following statement by using a sliding scale: “I feel competent I have enough clinical and educational training to deliver effective services to children with autism.” The scale provided a range from 0 (no confidence or strongly

disagree) to 100 (with full confidence, or strongly agree). During the pre-test, or the first administration of the AKS, experimental participants' average self-rating of confidence was 64/100. During the post-test, the experimental participants' average self-rating of confidence was 62/100. The control group's average confidence self-rating was 69/100 for the pre-test, and 73/100 for the post-test. For the experimental group, more participants' scores increased (4) than decreased (3). One individual chose not to respond to the confidence rating on the pre-test.

Table 4.9 shows the Independent Samples T-Test results for comparing the experimental group and control group change in confidence rating from pre-test to post-test. Since the significance of .369 is greater than .05, there are no significant differences in the means of the experimental group and control group confidence change scores.

Table 4.9(a): Independent Samples T-Test for Experimental vs. Control Group Pre-Post Confidence Ratings Group Statistics

Control or Treatment	N	Mean	Std. Deviation	Std. Error Mean
Cnfchange	7	-1.8571	17.73348	6.70262
	11	3.9091	8.82558	2.66101

Table 4.9(b): Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal Variances Assumed	4.480	.050	-.924	16	.369	-.576623	6.24082	-18.99619	7.46372
Equal Variances not Assumed			-.800	7.922	.447	-.576623	7.21153	-22.42445	10.89199

Table 4.10 shows the One Sample T-Test results for comparing the experimental group change in confidence rating from pre-test to post-test. Since the significance of .791 is greater than .05, there are no significant differences in the means of the experimental group confidence change scores from pre-test to post-test.

Table 4.10(a): One-sample t-test for Experimental Group Difference in Pre-Post Confidence Rating Group Statistics

N	Mean	Std. Deviation	Std. Error Mean
7	-1.8571	17.73348	6.70262

Table 4.10(b): Independent Samples Test

				95% Confidence Interval of the Difference	
t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
-.277	6	.791	-1.85714	-18.2579	14.5436

Table 4.11 shows the One Sample T-Test results for comparing the control group change in confidence rating from pre-test to post-test. Since the significance of .173 is greater than .05, there are no significant differences in the means of the control group confidence change scores from pre-test to post-test.

Table 4.11(a): One-sample t-test for Control Group Difference in Pre-Post Confidence Rating Group Statistics

N	Mean	Std. Deviation	Std. Error Mean
11	3.9091	8.82558	2.66101

Table 4.11(b): Independent Samples Test

				95% Confidence Interval of the Difference	
t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
1.469	10	.173	3.90909	-2.0200	9.8382

Table 4.12 shows the ANOVA for participant age and difference in confidence rating (Post-Pre). The F test statistic is less than the critical F-value ($1.362 < 1.96$). The significance level of .286 is greater than .05, so there are no significant differences in the means for changes in confidence ratings (Post-Pre) across age groups.

Table 4.12: ANOVA for Age and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	431.510	2	215.755	1.362	.286
Within Groups	2376.490	15	158.433		
Total	2808.000	17			

Table 4.13 shows the ANOVA for geography and difference in confidence rating (Post-Pre). The F test statistic is greater than the critical F-value ($7.679 > 1.96$). The significance level of .005 is less than .05, so there are significant differences in the means for changes in confidence ratings (Post-Pre) across geography. Of particular significance (.006), on average, participants in urban areas scored themselves 35 points higher on the confidence rating scale at post-test than did participants in rural areas. Also of significance (.009), on average, participants in suburban areas scored themselves 25 points higher on the confidence rating scale at post-test than did participants in rural areas.

Table 4.13(a): ANOVA and Post Hoc Tests for Geography and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1420.571	2	710.286	7.679	.005
Within Groups	1387.429	15	92.495		
Total	2808.000	17			

Table 4.13(b): Post-Hoc Tests

						95% Confidence Level	
			Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	Urban	Suburban	9.57143	7.27010	.408	-9.3125	28.4553
		Rural	35.00000*	9.61744	.006	10.0190	59.9810
	Suburban	Urban	-9.57143	7.27010	.408	-28.4553	9.3125
		Rural	25.42857*	7.27010	.009	6.5447	44.3125
	Rural	Urban	-35.00000*	9.61744	.006	-59.9810	-10.0190
		Suburban	-25.42857*	7.27010	.009	-44.3125	-6.5447

Table 4.14 shows the ANOVA for participant highest degree obtained and difference in confidence rating (Post-Pre). The F test statistic is higher than the critical

F-value ($2.186 > 1.96$), indicating a difference in means. However, the significance level of .160 is greater than .05, so the difference in the means for changes in confidence ratings (Post-Pre) across highest degree obtained is not significant.

Table 4.14: ANOVA for Highest Degree and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	355.298	1	355.298	2.186	.160
Within Groups	2438.467	15	162.564		
Total	2793.765	16			

Table 4.15 shows the ANOVA for timeframe of highest degree obtained and difference in confidence rating (Post-Pre). The F test statistic is less than the critical F-value ($.065 < 1.96$). The significance level of .977 is greater than .05, so there are no significant differences in the means for changes in confidence ratings (Post-Pre) for the timeframe of degree obtained.

Table 4.15: ANOVA for Date of Highest Degree and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	38.667	3	12.889	.065	.977
Within Groups	2769.333	14	197.810		
Total	2808.000	17			

Table 4.16 shows the ANOVA for years practiced as an SLP and difference in confidence rating (Post-Pre). The F test statistic is less than the critical F-value ($1.334 < 1.96$). The significance level of .303 is greater than .05, so there are no

significant differences in the means for changes in confidence ratings (Post-Pre) for years practiced as an SLP.

Table 4.16: ANOVA for Years Practiced and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	624.417	3	208.139	1.334	.303
Within Groups	2183.583	14	155.970		
Total	2808.000	17			

Table 4.17 shows the ANOVA for years experience with students with ASD and difference in confidence rating (Post-Pre). The F test statistic is less than the critical F-value (.094<1.96). The significance level of .962 is greater than .05, so there are no significant differences in the means for changes in confidence ratings (Post-Pre) for years experience with students with ASD.

Table 4.17: ANOVA for Years Experience with Students with ASD and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	55.375	3	18.458	.094	.962
Within Groups	2752.625	14	196.616		
Total	2808.000	17			

Table 4.18 shows the ANOVA for percentage of students with ASD on caseload and difference in confidence rating (Post-Pre). The F test statistic is less than the critical F-value (.462<1.96). The significance level of .713 is greater than .05, so there are no significant differences in the means for changes in confidence ratings (Post-Pre) for percentage of students with ASD on caseload.

Table 4.18: ANOVA for Percentage of Students with ASD on Caseload and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	252.788	3	84.263	.462	.713
Within Groups	2555.212	14	182.515		
Total	2808.000	17			

Table 4.19 shows the ANOVA for continuing education and difference in confidence rating (Post-Pre). The F test statistic is less than the critical F-value (.011<1.96). The significance level of .917 is greater than .05, so there are no significant differences in the means for changes in confidence ratings (Post-Pre) for continuing education.

Table 4.19: ANOVA for Continuing Education and Difference in Pre-Post Confidence Rating

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	1.969	1	1.969	.011	.917
Within Groups	2806.031	16	175.377		
Total	2808.000	17			

To further examine why the control group exhibited higher confidence change scores, ANOVA was conducted for the demographics of age, years experience as SLP, years experience with ASD, percent of ASD on caseload, highest degree, and timeframe of highest degree. Each p-value was greater than .05, so no significant differences existed in the mean confidence change scores of the control group across these particular demographics (Table 4.20). ANOVA could not be used for geography or continuing education because at least one group had less than two cases.

Table 4.20: ANOVA p-values for Control Group Confidence Change Scores Across Demographics

Demographic	p-value
Age	.874
Years Experience as SLP	.927
Years Experience with ASD	.254
% of ASD on Caseload	.520
Highest Degree	.848
Timeframe of Highest Degree	.982

4.1.2.5 ASD Questions

The final section of the Autism Knowledge Survey (AKS) consisted of twenty multiple-choice questions regarding autism within the context of a school environment. Each time the AKS was completed, participants were given a total score indicating the number correct out of the 20 ASD questions. IBM SPSS Statistical Software 22 was utilized to analyze data.

The first comparison was difference in AKS total scores between the experimental group and the control group (Table 4.21). To test the hypothesis that a difference existed, an independent samples t-test was used to compare the change in pre-test and post-test AKS scores between the experimental group and the control group.

Table 4.21(a): Independent Samples T-Test Experimental vs. Control Difference in Pre-Post AKS Scores Group Statistics

Control or Treatment	N	Mean	Std. Deviation	Std. Error Mean
Treatment	8	2.6250	1.18773	.41993
Control	12	.5833	2.39159	.69039

Table 4.21(b): Independent Samples Test

	Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal Variances Assumed	3.153	.093	2.224	18	.039	2.04167	.91788	.11328	3.97005
Equal Variances not Assumed			2.527	16.990	.022	2.04167	.80807	.33671	3.74662

Since the Lavene's Test (.093) is greater than .05, the investigator assumed variances were equal. For this reason, the top test ($p=.039$) was used, which is less than .05, so there is a significant difference in the means of the post-test AKS scores between the experimental group and control group (18df).

A one-sample t-test was used to compare the experimental group's pre-test and post-test scores to see whether a difference between pre-test and post-test AKS scores existed within this group. Table 4.22 shows the results of the one-sample t-test comparing the experimental group's pre-test and post-test scores. The mean difference between the two sets of scores was 2.6250, which was significant ($t=6.251$, 7df,

significance= 0.000). The null hypothesis is rejected in this instance since scores on the AKS increased for the experimental group after the online module was completed.

Table 4.22(a): One-Sample T-Test Experimental Difference in Pre-Post Test AKS Scores
Group Statistics

N	Mean	Std. Deviation	Std. Error Mean
8	2.6250	1.18773	.41993

Table 4.22(b): One Sample Test

				95% Confidence Level	
t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
6.251	7	.000	2.62500	1.6320	3.6180

A one-sample t-test was completed to compare the control group pre-test and post-test AKS scores. Results indicated a pre-post mean difference of 0.5833, standard deviation 2.39159, standard error mean 0.69039, t value= 0.845, 11 df, significance (2-tailed) 0.416, mean difference 0.5833, and the 95% confidence interval was lower -0.9362 to upper 2.1029. The significance for this test was greater than 0.05, indicating no statistically significant difference in the means, demonstrating that the control group *remained the same without the intervention (Table 4.23)*.

Table 4.23(a): One-Sample T-Test Control Difference in Pre-Post Test AKS Scores
Group Statistics

N	Mean	Std. Deviation	Std. Error Mean
12	.5833	2.39159	.69039

Table 4.23(b): One Sample Test

t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Level	
				Lower	Upper
.845	11	.416	.58333	-.9362	2.1029

The experimental group's AKS pre-test responses were compared to their post-test responses to identify areas in which ASD knowledge changed. As a group, experimental participants' correct responses improved from 40% (8/20) on the pre-test to 60% (12/20) on the post-test. Questions frequently *missed* on the pre-test that were answered *correctly on the post-test* addressed the following areas:

- intervention (Question #1,3),
- behavior and biology of ASD (Question # 4,6),
- use of visual supports (Question #5,16),
- handling case examples (Question #7,15),
- reasons for past unsuccessful outcomes (Question # 10),
- hierarchal support to teach new skills to individuals with ASD (Question #14),
- the hidden curriculum (Question #19), and
- generalization and task completion (Question #11).

All of these areas relate directly to the responsibilities of school-based SLPs in regard to ASD, especially to their role in assessment and intervention (ASHA, 2006). The improved performance of the experimental group on the AKS from pre-test to post-test suggests that the online training improved the participants' ASD knowledge base.

4.2 Qualitative Findings

The investigator analyzed the two open-ended discussion questions following qualitative data collection and analysis methods described by Creswell (2007). Open coding of words, phrases and sentences was followed by axial coding to link larger categories and smaller categories. Selective coding resulted in development of six themes.

Although the questions were intended to be distinct, responses to the initial discussion question, “How do you, as a school-based SLP plan to incorporate use of the Underlying Characteristics Checklist (UCC), the Individual Strengths and Skills Inventory (ISSI), and/or ABC-Iceberg in your assessments/re-evaluations of individuals with ASD? What is your hope/goal for sharing the idea of comprehensive planning with your colleagues- SLPs or other professionals?” actually spilled over into Discussion Question Two, “Describe two roadblocks/obstacles you anticipate with incorporating comprehensive assessment and planning in your school-based practice. How will you overcome those two difficulties?” As a result the responses were analyzed as one corpus.

The responses to the discussion questions demonstrated several themes: 1) some school systems already use aspects of Aspy and Grossman’s (2008) Ziggurat Model, 2) instruction in the Ziggurat Model can help educators become more aware of the underlying characteristics of ASD, 3) use of the Ziggurat Model can result in more consistent treatment and teaching of individuals with ASD, 4) the Ziggurat Model encourages participation of all team members, 5) use of the Ziggurat Model can be time-consuming in its current format, and 6) participants were unsure as to the best way to implement the model.

4.2.1 Validity

Experimental group participants were invited to complete member checks (See Appendix D). Participants were given two weeks in which to provide agreement or disagreement with justification by sending the investigator an e-mail. Two out of eight experimental group members provided feedback, and both members fully agreed with all themes.

4.2.2 Reliability

An expert in mixed methods research participated in inter-coder reliability check for all codes and themes with the investigator. The investigator and the expert discussed the meanings of codes. Each rater then coded thirty-seven comments for Discussion Question One and fourteen comments for Discussion Question Two. Codes were as follows: systematic team approach (STA), increased awareness (IA), consistency and collaboration (CC), everyone involved (EI), sharing the model (SM), and roadblocks/obstacles (RO). It should be noted that due to the nature of Discussion Question Two, the RO theme was changed to time issues (TI) since this discussion question was written to target all roadblocks/obstacles.

Once each rater had blindly coded each comment, the raters discussed points of agreement/disagreement with justification of those decisions. A contingency table of the agreements/disagreements was constructed in order to calculate the reliability statistic Cohen's kappa for each of the two discussion questions. Cohen's kappa for Discussion Question One was 0.5, which is fair-to-good. Cohen's kappa for Discussion Question Two was 0.7, which is considered satisfactory.

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Chapter 5 Conclusion

5.1 Discussion

A mixed methods design was employed to answer the following research question: “Does the ASD knowledge base of ASHA-certified school-based SLPs change when they complete an online training module based upon Aspy and Grossman’s Ziggurat Model? If so, what are those changes?”

5.1.1 Quantitative

5.1.1.1 Participant Demographics

All twenty participants were female, which is consistent with the 97% representation of female members of ASHA (ASHA, 2013). Also consistent with the ASHA SLP population, the majority (35%) of this study’s participants worked in the South (ASHA, 2013). It is unknown how the age of participants compares to the ASHA membership because neither the ASHA Membership Survey (2013) nor the ASHA Schools Survey (2014) requested such information from respondents.

5.1.1.2 Did a change in ASD knowledge occur?

The answer to the first part of the research question “Does the ASD knowledge base of ASHA-certified school-based SLPs change when they complete an online training module based upon Aspy and Grossman’s Ziggurat Model?” is “Yes.” The results suggest that the online training changed the ASD knowledge base of school-based SLPs since their scores improved. The null hypothesis was rejected because a significant *difference existed between the experimental group and the control group* pre-test and post-test AKS scores, as demonstrated by an independent samples t-test ($p=.039$, 18df).

Additionally, the *experimental* group's pre-test and post-test scores on the knowledge base portion of the survey were compared using a one-sample t-test. The null hypothesis was rejected also in this instance as scores on the AKS for the *experimental* group increased *after the online module was completed*. To further support this evidence that the training improved the knowledge base, a one-sample t-test was completed to compare the *control* group pre-test and post-test scores on the AKS ASD questions was conducted. There was no difference in the means (acceptance of the null hypothesis) indicating that the *control group remained the same without the intervention*.

5.1.1.3 How did the ASD knowledge change?

This study adds support to the literature by the fact that the online training *improved the ASD knowledge base of school-based clinicians*. More specifically, the experimental group's knowledge improved in the specific areas of intervention, behavior and biology of ASD, visual supports, handling case examples, reasons for past unsuccessful outcomes, hierarchal support to teach new skills to individuals with ASD, the hidden curriculum, and generalization and task completion.

This study also suggests that the *confidence level* of the school-based SLPs' in providing effective services to children with ASD improved after completion of the online training. Even though the control group exhibited a higher average post-test confidence rating than the experimental group, the online training increased confidence ratings for the majority of individual participants in the experimental group. It is noted that control group participants had a higher average confidence level at pre-test. This may be explained by the fact that the largest number of control group participants reported working in suburban areas, and there were no control group participants who

reported working in rural areas. In this particular study, school-based SLPs working in rural areas exhibited the lowest means in confidence ratings from pre-test to post-test while those SLPs working in urban areas exhibited the highest means in confidence ratings from pre-test to post-test. This imbalance between the experimental group and control group may explain the elevated scores of the control group. The control group reported having more years experience with ASD, higher percentages of students with ASD on caseload, higher education, and more hours of continuing education in ASD, which may also contribute to the higher confidence scores.

5.1.2 Qualitative

Qualitative data from the discussion board responses answered the second portion of the research question—how the autism knowledge base of school-based SLPs changed. Discussion Question One asked, “How do you, as a school-based SLP plan to incorporate use of the Underlying Characteristics Checklist (UCC), the Individual Strengths and Skills Inventory (ISSI), and/or ABC-Iceberg in your assessments/re-evaluations of individuals with ASDs? What is your hope/goal for sharing the idea of comprehensive planning with your colleagues -- SLPs or other professionals?” As participants answered Discussion Question One, some of the responses actually spilled over into Discussion Question Two, which asked, “Describe two roadblocks/obstacles you anticipate with incorporating comprehensive assessment and planning in your school-based practice. How will you overcome those two difficulties?”

The responses to the discussion questions demonstrated six themes. Each one will be explained below.

1) *Some school systems already use aspects of the Ziggurat Model, consistent with the findings of Wilkerson et al., (2011).* Participants reported that, even though they did not follow the structure of the model, their school systems incorporated a team approach.

One participant stated, “We already incorporate discussion of student strengths and underlying characteristics, so I think my teams will appreciate the structure provided by these forms.”

While different deficit areas are discussed at IEP meetings, they are not done so as systematically, and by theme, as they would be following the example of the Ziggurat Model. This suggests that although systems already use aspects of the Ziggurat Model, there remains room for change.

Another participant stated:

My team and I do similar types of information collection, and our IEP meetings sound very similar to the video clips in this module. Not every meeting, however, so perhaps consistently using the information gathering process at every meeting could provide a benefit.

2) *Instruction in the Ziggurat Model can help school-based SLPs and educators become more aware of the underlying characteristics of ASD, especially in the area of student strengths, by administration and implementation of the Individual Strengths and Skills Inventory.* Participants reported that strengths of students with ASD are often overlooked, especially when writing IEPs, because IEPs are so often deficit-based. One participant stated, “I plan to be more aware of student strengths, making notes of areas of strength during data collection.” Participants further stated that they disregard student

strengths during treatment due to being so focused on the areas of concern. Becoming more aware of the underlying characteristics of ASD would have the advantage of helping educators better make education strategies based upon students' characteristics. These first two themes indicated that the Ziggurat Model might be helpful in teaching pre-service and experienced school-based SLPs to develop "comprehensive [programs] individualized to the strengths and deficits of [people] with [ASD]" (ASHA, 2015).

3) *Use of the model can result in more consistent treatment and teaching of individuals with ASD.* Consistency with treatment and teaching was a concern for some participants, describing the need for specific vocabulary for specific students. One participant stated, "It is assumed that all staff have the same knowledge but actually [they] don't." Providing training in the Ziggurat Model would help provide that uniform knowledge base. This Ziggurat Model theme addresses the importance of a unifying model in collaboration (ASHA, 2006).

4) *The model encourages participation of all team members.* IEP team participants differ across individuals with ASD, since each individual with ASD is different and presents with different characteristics and needs. The Ziggurat Model provides a unifying base for each team and mandates every stakeholder be wholly involved in the assessment and treatment/teaching planning for the individual with ASD, again addressing the importance of working with families, collaboration, and advocacy (ASHA, 2006). One participant expressed, "The teachers view the underlying characteristics as belonging to related services exclusively. This has bothered me for a long time because I know that collaborative planning and implementation are best for students with complex needs as seen in ASD."

5) *Use of the model can be time consuming in its current format.* The Ziggurat Model, in its current paper form, can be quite time-consuming. Participants realized that the initial assessment using the UCC, ISSI, and ABC-Iceberg would require the most time (which will vary by case), while re-evaluations and/or follow-up assessments could be simplified by editing previous information. While the paper forms provide a concise visual for IEP meetings, participants suggested that an online portal be developed for the documents in a Google or iCloud format. This would enable all team members to access the information at any time, from any location, to more effectively and efficiently contribute to the assessment and treatment planning. Additionally, information could be linked from one year to another. Another benefit of online forms would be that documents would be typed, eliminating guesswork with others' handwriting.

6) *Participants were unsure as to the best way to implement the model.* Despite agreeing on the aforementioned benefits of the Ziggurat Model, the participants did not have any suggestions on the best way to share and implement the model. Participants conveyed they were unsure of the best way to share their knowledge of the Ziggurat Model with their colleagues due to the philosophical shift required to actually apply it. Some participants suggested obtaining approval with administration, such as special education directors or lead SLPs. Others decided they would try certain aspects of the model (perhaps an assessment) on a less formal basis, with one student, before sharing the model with colleagues.

5.2 Limitations

5.2.1 Attrition and Low Sample Size

There was a mildly high attrition rate in this study. Attrition concerns loss of participants in research (Shadish & Cook, 2009). Loss of participants means loss of data. Loss of data indicates that results may not be representative of a study's target population. Researchers have addressed attrition in several ways. Attrition rates have simply been reported as dropout percentages in some studies. In other studies, attrition has been regarded as a more sophisticated and significant measure with meaningful impact on results (Preston et al., 2013; Kaushal, 2014; Mein, 2012; Shadish & Cook, 2009; Stein et al., 2011). Some researchers have recommended ways to prevent and report attrition (Amireault, 2014; Kaushal, 2014; Preston et al., 2013).

The accepted rate of traditional research/training attrition has been reported to be approximately 20% (Amireault, 2014; Preston et al., 2013). However, Todkill and Powell (2013) indicated that attrition rates in randomized control trials of Internet based interventions ranged from 1% to 50%. Clow (2013) reported attrition rates as high as 90% for Massive Online Open Courses (MOOCs). The attrition rate for this study was 23%, which is minimally elevated for traditional research/training but on the low relative to the attrition rates reported for *Internet based* interventions. Differences between completers and non-completers in this study could not be determined. Future research might consider collecting demographic data prior to prospects agreeing to participate (Justice, Skibbe, McGinty, Piasta, & Petrill, 2011). Unfortunately, requesting such information at the outset may also discourage participants from continuing in a study, again contributing to a high attrition rate.

Reasons for participants' withdrawals from this study are largely unknown, since with the exception of two who withdrew for "not having enough time," participants did not indicate a reason for withdrawing. Additionally, no comparisons could be made of withdrawers versus completers since demographic information had not been collected at the time of withdrawal. This data was collected after the pre-test, and the investigator withdrew participants who did not complete the pre-test and/or the initial discussion board after attempting to communicate with those participants via e-mail.

5.2.2 No Measures of Maintenance or Generalization of Information Learned

This particular online training in the Ziggurat Model lacked in Fixsen and colleagues' (2003) core implementation concepts. This study did not provide support throughout the lifetime of the SLPs' use of the Ziggurat Model. Likewise, participant performance evaluations were not a requirement, so the continued use of the Ziggurat Model for the participants of this study will remain unknown. No real-time on-the-job coaching was provided in this training module. Joyce and Showers (2002) found that on-the-job coaching resulted in use of new skills in the work environment.

5.2.3 Control Group Confidence Ratings

The fact that the control group exhibited higher confidence ratings than the experimental group at pre-test is another concern in this study because it overshadows the change in the confidence ratings of the experimental group. The imbalance in the demographics of the two groups may explain the elevated confidence ratings of the control group. The control group's highest number of participants reported working in suburban areas (double of those in the experimental group), and the statistical analysis in this study showed that participants in suburban and urban areas scored themselves

significantly higher than rural participants on their confidence in service delivery. Even though statistical analysis showed no significant differences relative to the confidence change scores in the control group for particular demographics, the control group reported having more experience with ASD, higher percentage of students with ASD on caseload, higher education, and more continuing education hours in ASD. Even though the control group's confidence in service delivery increased, their knowledge did not improve without training. Conversely, the experimental group's knowledge significantly improved, but their confidence did not significantly improve.

5.3 Ziggurat Model Online Training and Adult Learning

The Ohio Center for Autism and Low Incidence (OCALI) designed each online module “to be consistent with research on [*how adults learn*]; information is presented at a universal reading level, and [*interactive activities*] both reinforce knowledge and teach learners how to make the latest research [*applicable to real life*]” (OCALI, 2013). The Autism Internet Module (AIM), titled “Comprehensive Program Planning for Individuals With Autism Spectrum Disorders” teaches Apsy and Grossman's (2008) Ziggurat Model. The module includes narratives, case studies, video clips, and examples in an asynchronous format. These aforementioned features of the OCALI AIMS and the additional discussion boards that were required in this online training addressed Knowles' and Fink's principles of: 1) the learner's need for information, 2) the learner's self-concept, 3) learners using previous experiences to relate to new knowledge, 4) readiness to learn, 5) learners have different learning styles, 6) learners must be motivated, and 7) the human dimension of learning (Knowles, 1970; Fink, 2003). In particular, the discussion boards provided opportunities for more individualized

instruction in that the adult learners shared previous experiences to relate their new knowledge. This individualized instruction also provided the investigator rich qualitative data from which to derive themes.

5.4 Pros and Cons of Online Research/Training

It is clear that online research/training has advantages and disadvantages. The investigator chose to present the intervention for this study via the Internet largely because the OCALI AIM for the Ziggurat Model was already designed and is a free resource that is widely available to practicing professionals. It is noted that this could be a bias in the selection of the chosen intervention. The online intervention allowed participants to complete the modules at their own pace, within a two-week timeframe and the discussion questions within one week for each question. The discussion periods required participants to submit at least three different responses on three different days in order to ensure true ongoing discussion. Participants were required to respond to the investigator's initial topic posting and then to two different participants' postings. Record keeping for the researcher was simplified with the participants' responses being easily accessible and easily transferred to Microsoft Word and Microsoft Excel for data analysis. Use of the Internet in this study prevented the need for a physical facility in which to conduct this research, significantly reducing costs and the need for additional personnel.

While the study's design was convenient for the investigator and the participants, the design of the study also presented with several issues. No face-to-face interaction occurred between the participants and the researcher. The intervention phase, while many participants had positive comments about it, could have been improved with some

face-to-face instruction. ASHA's survey data indicates that most ASHA certified SLPs prefer in-person professional development over online methods (ASHA, 2013). Online professional development with some face-to-face interaction may be a way to close the gap for SLPs, providing them with access to in-person professional development without the need to travel. Software programs exist that could enable such interactions, but such software adds additional computer requirements and more work and time on the part of the participant. With an already elevated attrition rate, it is likely that these additional requirements would increase the attrition rate. Another issue in this study was e-mail usage. While convenient and effective in providing electronic documentation, e-mails are beneficial only if individuals check and read them. Requesting a return receipt on sent e-mails would have provided information on which participants actually read the messages communicating about the study.

5.5 From Science to Practice

Consistent with the findings of Schwartz and Drager (2008), this study shows that the school-based SLPs who participated in this mixed methods research design *initially* exhibited a need for increased knowledge of ASD. Participants also had *insecurities* in their service delivery to this population. As adult learners, school-based SLPs expect: 1) learning to be convenient, 2) their responses to be valued, 3) to be given the opportunity to relate personal experiences as a part of learning (Dumchin, 2010; Magnussum, 2006). The online training of Aspy and Grossman's Ziggurat Model utilized in this study met most of these expectations and provided an effective method with which to train school-based SLPs in using a comprehensive framework based on EBP to: 1) better assess and treat the social-communication symptoms of ASD, 2) work with families, 3) collaborate

with all team members, 4) participate in professional development, and 5) better advocate for individuals with ASD (ASHA, 2006). It should be noted that the Ziggurat Model is not an intervention but a framework *for* intervention. Although some evidence of its effectiveness exists, more rigorous research would help establish the effectiveness of this framework in planning and guiding intervention for individuals with ASD.

The qualitative data from this study resulted in six themes that serve to enlighten future training efforts: 1) some school systems already use aspects of Aspy and Grossman's (2008) Ziggurat Model, 2) instruction in the Ziggurat Model can assist educators become more aware of the underlying characteristics of ASD, 3) use of the Ziggurat Model can provide more consistent treatment and teaching of individuals with ASD, 4) the Ziggurat Model encourages participation of all team members, 5) use of the Ziggurat Model can be time-consuming in its current format, and 6) participants were unsure as to the best way to implement the Ziggurat Model.

The IEP team is responsible for selecting and providing the most appropriate EBP in the individual's least-restrictive environment (LRE) to improve social-communication skills. Many factors influence that decision. Improving the knowledge base (competence) and confidence of school-based SLPs in the area of ASD provides them with the tools they need to fulfill their expected roles (ASHA, 2006). The underlying philosophy of the Ziggurat Model focuses on the individuality of each individual with ASD and using that individuality across the lifespan to climb the pyramid of hope . . . hope of independence and self-worth for individuals with ASD and hope of relief for some families.

5.6 Recommendations

Results of this study should be applied with caution due to the small sample size and mildly high attrition rate. Future studies should collect demographic information as a prerequisite to becoming a participant to better understand which participants may choose to withdraw from web-based research. Additionally, adding a face-to-face component to the training used in this study may enhance the experience. It is further suggested that this study be replicated with a larger sample size. Researchers may study the effectiveness of teaching the Ziggurat Model taught in this format compared to in-person instruction. Another suggestion for future research would be examining whether participants learn the same amount of information without the discussion portion of the training. Another suggestion for future research is tracking the amount of time participants spent interacting with the module. Future studies may also investigate the effectiveness of increased knowledge in ASD on practice, especially regarding the richness of the instructional content for students with ASD before and after such training.

Appendix A: Definition of Autism Spectrum Disorder (from DSM-V, 2013)

Autism Spectrum Disorder 299.00 (F84.0) Diagnostic Criteria

A. Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history (examples are illustrative, not exhaustive, see text):

1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
2. Deficits in nonverbal communicative behaviors used for social interaction, ranging, for example, from poorly integrated verbal and nonverbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and nonverbal communication.
3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behavior to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interest in peers.

Specify current severity:

Severity is based on social communication impairments and restricted repetitive patterns of behavior (see Table 2).

B. Restricted, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the following, currently or by history (examples are illustrative, not exhaustive; see text):

1. Stereotyped or repetitive motor movements, use of objects, or speech (e.g., simple motor stereotypies, lining up toys or flipping objects, echolalia, idiosyncratic phrases).
2. Insistence on sameness, inflexible adherence to routines, or ritualized patterns or verbal nonverbal behavior (e.g., extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to take same route or eat food every day).
3. Highly restricted, fixated interests that are abnormal in intensity or focus (e.g., strong attachment to or preoccupation with unusual objects, excessively circumscribed or perseverative interest).

Appendix A: Definition of Autism Spectrum Disorder (continued)

4. Hyper- or hyporeactivity to sensory input or unusual interests in sensory aspects of the environment (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).

Specify current severity:

Severity is based on social communication impairments and restricted, repetitive patterns of behavior (see Table 2).

C. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life).

D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.

E. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make comorbid diagnoses of autism spectrum disorder and intellectual disability, social communication should be below that expected for general developmental level.

Note: Individuals with a well-established DSM-IV diagnosis of autistic disorder, Asperger's disorder, or pervasive developmental disorder not otherwise specified should be given the diagnosis of autism spectrum disorder. Individuals who have marked deficits in social communication, but whose symptoms do not otherwise meet criteria for autism spectrum disorder, should be evaluated for social (pragmatic) communication disorder.

Specify if:

With or without accompanying intellectual impairment

With or without accompanying language impairment

Associated with a known medical or genetic condition or environmental factor

(**Coding note:** Use additional code to identify the associated medical or genetic condition.)

Associated with another neurodevelopmental, mental, or behavioral disorder

(**Coding note:** Use additional code[s] to identify the associated neurodevelopmental, mental, or behavioral disorder[s].)

Appendix A: Definition of Autism Spectrum Disorder (continued)

With catatonia (refer to the criteria for catatonia associated with another mental disorder, pp. 119-120, for definition).

UNIVERSITY OF KENTUCKY RESEARCH

Effects of Online Training on the Ziggurat Model on the Autism Knowledge of School-Based SLPs



This study is to determine whether and how an online autism module affects autism knowledge in school-based SLPs. The intent of the module is to improve treatment for students with autism by making this autism framework easily available to practicing SLPs.

You may be eligible to participate if you:

- are a member of the American Speech-Language Hearing Association (ASHA),
- speak English, and
- work with at least one child with Autism Spectrum Disorders (ASDs).

For more information, contact:

Wendy Wilkerson, M.S., CCC-SLP
Phone: (931)273-1007
Email: wlpoll2@g.uky.edu



www.UKclinicalresearch.com

Autism

REHAB-114_flyer #

Appendix C: Participant Letter

Dear School-Based Speech-Language Pathologist,

We would like to invite you to participate in a research study about school-based speech-language pathologists' knowledge about autism. You are being invited to take part in this research study because you are an ASHA-certified member of the School-Based Special Interest Group, you speak English, and work with at least one child with Autism Spectrum Disorders (ASDs). If you volunteer to take part in this study, you will be one of about 70 people to do so nationally.

This study is being done by Wendy L. Wilkerson, M.S., CCC-SLP. Wendy is a doctoral student at the University of Kentucky in the Department of Rehabilitation Sciences, and also a school speech-language pathologist in Tennessee. She is being guided in this project by Judith L. Page, Ph.D., CCC-SLP.

The purpose of the study is to determine the effect of an online module describing a new treatment framework for autism on autism knowledge in school-based speech-language pathologists. The intent of the module is to improve treatment for students with autism by making the treatment framework easily available to practicing speech-language pathologists.

All of the activities for this study will be done online on the computer of your choice. To participate, you will need to have reliable Internet access and a Google/Gmail account.

If you agree to participate in the study, you will initially be asked to complete a survey on ASDs. The survey will first request some basic demographic information about you and your work setting and then ask several questions about autism and its treatment. You may skip any question in the case you prefer not to answer. The survey should take about 20 minutes to complete. Following the initial survey, you may be asked to complete an online training incorporating online modules and discussion. This training will require you to complete a two-hour Internet module at your own pace within a two-week timeframe and then participate in two discussion threads over another two-week period, with three responses per week (total of 6 responses). Approximately one month after the initial survey is completed, all participants will be asked to repeat the survey.

Participation in this study is strictly voluntary. In exchange for your participation you will be given the opportunity to earn 2 hours of continuing education credits (with a completion certificate) through participation in the online training. You may stop at any time during the study and still have all the rights and benefits you had before volunteering. If you do not wish to participate in the study, you may be able to obtain similar information via independent study or participation in other continuing education activities.

Appendix C: Participant Letter (continued)

There are no known risks to participating in this study and you will incur no costs, other than your time. The study incorporates only normal education procedures used in on-line continuing education and, as such, provides no risks to you. Also, all data will be collected on REDCap, a secure fire-walled, password-protected server and the PI will use a crosswalk to separate personal information from actual participant identifying information.

We will make every effort to keep confidential any research records that identify you to the extent allowed by law. Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered. You will not be personally identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private.

Please be aware, while we make every effort to safeguard your data once received on our servers via REDCap, given the nature of online surveys, as with anything involving the Internet, we can never guarantee the confidentiality of the data while still en route to us.

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. If at any time you have questions about the study, you can contact the investigator, Wendy Wilkerson at wlpoll2@g.uky.edu or (931)273-1007 or Dr. Page, her faculty advisor (jlpage01@uky.edu, 859-218-0571). If you have complaints, suggestions, or questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky at 859-257-9428 or toll free at 1-866-400-9428.

Appendix C: Participant Letter (continued)

By agreeing to complete the first survey you are providing your consent to participate in the study. You are also attesting to the fact that you meet the following qualifications:

- Hold a current CCC-SLP.
- Are currently employed at least part time as a school-based SLP,
- Are currently (most recently school year) providing services to at least one student with ASD, and
- Are not currently enrolled in another study related to autism.

We thank you for your interest in this study and look forward to working with you,

Sincerely,

Wendy L. Wilkerson, M.S., CCC-SLP, Principal Investigator
Dept. of Rehabilitation Sciences, University of Kentucky
wlpoll2@g.uky.edu
(931)273-1007

Judith L. Page, Ph.D., CCC-SLP, Faculty Advisor
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(859)218-0571

Confidential

Page 1 of 5

Autism Knowledge Survey

Please complete the survey below.

Thank you!

Contact Information

First Name

Last Name

Street, City, State, ZIP


Phone number

E-mail

(Include Area Code)

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Appendix D: Autism Knowledge Survey (continued)

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General Information

Please select a response for the following questions. If you prefer NOT to respond, then simply SKIP that question. Thank you for your participation!

Age (years)

☐ 20-35
☐ 36-51
☐ 52-67
☐ 68+

Gender

☐ Female
☐ Male

I consider the geographic area where I work to be

☐ Urban
☐ Suburban
☐ Rural

Number of years you have practiced as a speech-language pathologist

☐ 0-5
☐ 6-10
☐ 11-20
☐ 21-30
☐ 31-40+

The highest degree I have earned is

☐ Bachelors
☐ Masters
☐ Masters+ 30
☐ Specialist
☐ Doctorate

The date I earned my highest degree was

☐ Prior to 1979
☐ 1980-1989
☐ 1990-1999
☐ 2000-2009
☐ 2010-present

Number of years experience with students with Autism Spectrum Disorders (ASDs)

☐ 0-5
☐ 6-10
☐ 11-20
☐ 21-30
☐ 31-40+

Percentage of my student population that has a diagnosis of ASDs

☐ 0-25
☐ 26-50
☐ 51-75
☐ 76-100

I have obtained continuing education credits related to ASDs since receiving my highest degree

☐ Yes
☐ No

Approximately how many hours of continuing education in the area of ASDs have you completed?

☐ 1-5
☐ 6-10
☐ 11-15
☐ 16+

Have you ever heard of Aspy and Grossman's Ziggurat Model?

☐ Yes
☐ No

Indicate your experience with Aspy and Grossman's Ziggurat Model:

☐ Only heard of it
☐ Have participated in a workshop
☐ Completed course focused on this model

I feel competent I have enough clinical and educational training to deliver effective services to children with autism.

Strongly Disagree Strongly Agree

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Appendix D: Autism Knowledge Survey (continued)

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Questions about ASDs

The following questions require you to choose the one BEST answer. Remember, you may SKIP any question if you prefer not to answer.

Which of the following is a TRUE statement based upon your knowledge of interventions for individuals with ASDs?

- ☐ A functional behavior assessment (FBA) treats knowledge of specific diagnoses as irrelevant for program planning.
- ☐ The underlying characteristics of ASDs have been a priority in the past.
- ☐ Medical diagnostic reports provide sufficient information for effective intervention planning in the educational setting.
- ☐ Assessment protocol is not as important as intervention protocol.

The LEAST important factor to consider when improving the communication skills of an individual with ASD is:

- ☐ Sensory differences and biological needs
- ☐ Type of autism diagnosis
- ☐ Structure and visual/tactile supports
- ☐ Task demands

Which of the following contributes to effective intervention for individuals with ASDs:

- ☐ Zone of proximal development, multidisciplinary teams, and assistive technology
- ☐ Reinforcement, zone of proximal development, and multidisciplinary teams
- ☐ OT consult, zone of proximal development, and reinforcement
- ☐ Zone of proximal development, assistive technology, and structural supports

Which of the following is TRUE about behavior and biology in regard to ASDs?

- ☐ Unmet sensory and biological needs have minimal effect on behavior.
- ☐ The best potential for constructive or positive behavior occurs within health and physical equilibrium.
- ☐ Individuals with ASDs exhibit the same biology and same behaviors.
- ☐ ASDs have questionable genetic and neurologic underpinnings.

Choose what should be the MOST effective visual support strategy for the client described below: During class transition times, Kenneth walks briskly in the middle of the hallway with his hands out widely from his body, often loudly rehearsing his favorite movie quotes.

- ☐ Visual schedule
- ☐ Social Stories
- ☐ Video modeling
- ☐ Comic Strip Conversation

Which of the following is the BEST strategy for increasing a desired behavior?

- ☐ An individual with ASD is rewarded for good effort across settings.
- ☐ An individual with ASD is rewarded on a varied schedule in a variety of settings.
- ☐ An individual with ASD is rewarded in the same manner every time the desired behavior occurs in the same setting.
- ☐ An individual with ASD is repetitively rewarded for the desired behavior in the same setting.

Caroline's speech-language pathologist (SLP) is seeing her at 8:00am due to a school-wide assembly during her typical 12:30pm speech time. Caroline lacks focus at the beginning of the session but then performs at a more expected level halfway through. More than likely, the schedule change affected which of these areas:

- ☐ Reinforcement, skills to be taught, task demands
- ☐ Biological needs, structure and visual/tactile supports, and task demands
- ☐ Biological needs, reinforcement, and skills to be taught
- ☐ Reinforcement, zone of proximal development, and goals for the session

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When considering the level of task demands, the following are the BEST strategies:	<input type="radio"/> Supports, use of special interests, and making tasks easy to result in success <input type="radio"/> Supports, use of special interests, and inclusion of typically-developing peers <input type="radio"/> Supports, use of special interests, and building in predictability <input type="radio"/> Supports, use of special interests, and using challenging tasks
Keys to comprehensive planning for individuals with ASDs include:	<input type="radio"/> Assessment, design, program planning, and progress monitoring <input type="radio"/> Assessment, design, implementation, and progress monitoring <input type="radio"/> Assessment, progress monitoring, reassessment, and implementation <input type="radio"/> Assessment, design, implementation, and reassessment
In general, outcomes for individuals with ASDs have fallen short of intended outcomes in the past due to (Choose the BEST answer):	<input type="radio"/> Lack of specifics for successfully carrying out Individualized Education Programs (IEPs) <input type="radio"/> Lack of appropriately-trained personnel <input type="radio"/> Lack of appropriate IEP goals <input type="radio"/> Lack of appropriate therapy materials
The following are examples of generalization targets for task completion:	<input type="radio"/> Completing classwork with teacher assistance in the classroom, asking for help from an assistant with all tasks, and independently using task organizer <input type="radio"/> Turning in assignments after multiple reminders from an assistant and teacher, peer writing in task organizer for individual with ASD, and independent completion of homework <input type="radio"/> Completing homework turning in assignments, turning in classwork after a few reminders from an assistant, and working with visual cues in the classroom <input type="radio"/> Completing homework, turning in assignments, turning in classwork, and working independently
Which of the following is NOT an area that should be addressed when assessing strengths and weaknesses of an individual with ASD:	<input type="radio"/> Restricted patterns of behavior <input type="radio"/> Sensory and biological differences <input type="radio"/> Quantity and quality of friendships/relationships <input type="radio"/> Cognitive differences
Choose the item that should NOT be included as a component to a complete intervention:	<input type="radio"/> Includes antecedent, behavior, and consequence strategy <input type="radio"/> Addresses underlying characteristics <input type="radio"/> Includes structure/visual tactile supports <input type="radio"/> Addresses physical characteristics
The following is the BEST hierarchical approach when teaching an individual with ASD a new skill:	<input type="radio"/> Skills to teach, task demands, reinforcement, structure and visual/tactile supports, and sensory differences and biological needs <input type="radio"/> Sensory differences and biological needs, task demands, structure and visual/tactile supports, and skills to teach <input type="radio"/> Reinforcement, sensory differences and biological needs, task demands, structure and visual/tactile supports, and skills to teach <input type="radio"/> Sensory differences and biological needs, reinforcement, structure and visual/tactile supports, task demands, and skills to be taught

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<p>Michael is a middle-school-aged boy with ASD who has difficulty coping with loud noises and standing in line and close to other people, especially in the cafeteria. Choose the BEST sensory strategy to aid Michael in coping with lunch time.</p>	<p> <input type="radio"/> Provide him with a visual schedule. <input type="radio"/> Provide him with a snug-fitting backpack and earbuds/pod. <input type="radio"/> Provide him with a snug-fitting weighted vest and earphones. <input type="radio"/> Provide him with a Social Story. </p>
<p>Visual schedules are effective in which ONE of the following examples:</p>	<p> <input type="radio"/> Pictures are used to show events. <input type="radio"/> A student is informed of a schedule change that veers from the typical school day. <input type="radio"/> A student uses a visual schedule with one teacher, once daily. <input type="radio"/> Words are used to show events. </p>
<p>Hosea recently stopped responding to a varied reinforcement schedule of playing ping pong by himself on a return board. Select the statement below which BEST indicates why this reinforcement has become ineffective:</p>	<p> <input type="radio"/> The schedule of a reinforcer does not matter. <input type="radio"/> The value of a reinforcer may change over time. <input type="radio"/> Reinforcement has no impact on individuals with ASDs. <input type="radio"/> The value of a reinforcer remains constant. </p>
<p>Stephen, a 6th grader with an ASD, has a special interest in drawing trains. Appropriate use of his special interest as a part of intervention can:</p>	<p> <input type="radio"/> Cause him to be motivated <input type="radio"/> Cause him to be distracted <input type="radio"/> Cause him to avoid a challenge <input type="radio"/> Cause him to perseverate on trains </p>
<p>The "hidden curriculum" consists of lessons which are "seemingly obvious" to individuals who develop typically but must be taught to individuals with ASDs. Choose the BEST examples of "hidden curriculum" from the choices below:</p>	<p> <input type="radio"/> Learning to write the alphabet, keeping busy, exercising restraint, and conducting oneself courteously <input type="radio"/> Learning to wait quietly, keeping busy, exercising restraint, and conducting oneself courteously <input type="radio"/> Learning to wait quietly, learning to count, exercising restraint, and conducting oneself courteously <input type="radio"/> Learning to wait quietly, keeping busy, answering questions about a passage read aloud, and conducting oneself courteously </p>
<p>Choose the FALSE characteristic of a written comprehensive plan:</p>	<p> <input type="radio"/> Ensures that academic and social needs are being met throughout the school day <input type="radio"/> Recognizes individuals with ASDs have complex needs in multiple areas <input type="radio"/> Provides individualized approach to planning <input type="radio"/> Mandates a rigid structure to follow </p>

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Appendix E: Member Check Letter

August 17, 2015

Dear Participant,

Thank you for participating in the research study titled "Effects of Online Training on the Ziggurat Model on the Autism Knowledge Base of School-Based SLPs". Now that you have completed all requirements of the study, I am asking you to do one more thing - revisit the online Discussion Board <https://groups.google.com/forum/#!forum/autism-training-private-group> and, after reviewing the Discussion Board, compare the information there with the overall themes listed below to ensure I have interpreted the group data accurately. Please send me an e-mail message to wipoll2@uky.edu, stating whether you agree or disagree with my listing of overall themes. Also, please let me know if you see any themes I may have overlooked. Results from this study will be disseminated at the ASHA Convention on Thursday, November 12, 2015 at 3:30 pm as a Technical Session.

Overall Themes:

- 1) some school systems already use aspects of Aspy and Grossman's (2008) Ziggurat Model,
- 2) the model can assist educators become more aware of the underlying characteristics of ASD,
- 3) the model can provide more consistent treatment and teaching of individuals with ASD,
- 4) the model encourages participation of all team members,
- 5) the model can be time-consuming in its current format, and
- 6) the best way to share and implement the model with colleagues is currently unknown.

Thank you again for your participation,

Wendy L. Wilkerson
Primary Investigator

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